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The Philippine Agriculturist

(University of the Philippines Publications: Series A)

October, 1923

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The Philippine Agriculturist

(University of the Philippines Publications: Series A)

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THE WAYS OF SCIENCE

The following excerpts on this idea were taken from an article by Edwin E. Slosson on *Science remakes the world* in *The World's Work*, March, 1923.

Notice that the revolutions of science are achieved without the use of arms or argument. Here we see cases where millions of people are affected and the course of history altered yet neither force nor propaganda is employed.

The scientist does not have to persuade or convince anybody. He either has discovered something or he has not. In either case his talking about it will make little difference. There is comparatively little debate nowadays in scientific circles over scientific questions, nothing like the time taken up by controversy in politics, theology, art, or literature. What discussion there is among scientists is mostly over modes of interpretation or rivalry in priority or the policy of the profession.

The method of science is economy of thought. The aim of science is control of the future. Science shows how these new forces can be acquired and managed and what benefits can be derived from their employment. But science has no authority to ensure that the world will make proper use of its gifts. Men may employ them for their own destruction. In fact they do.

In short, science provides the motive power, but not the motive for the use of power. Consequently the scientist should not be blamed when we see his well intended and valuable discoveries employed to increase the misery of the world instead of alleviating it.

Napoleon said:

> "The true conquests, the only conquests that cost no regrets, are those achieved over ignorance."

But like territorial conquests the conquests over ignorance may curse the conquerors if they are improperly employed.

But we must not stop the advance of knowledge for fear of the consequences. In the warfare of man with nature there is no truce. Unless man can turn the forces to his own advantage he will be crushed by them. Unless man can establish his supremacy and superiority over the world of nature he will sink again to the level of the brute from which he has risen.

As Matthew Arnold puts it in his

SONNET TO AN INDEPENDENT PREACHER

"Know, man hath all which Nature hath, but more,
And in that *more* lies all his hopes of good.
Nature is cruel, man is sick of blood;
Nature is stubborn, man would fain adore:
Nature is fickle, man hath need of rest;
Nature forgives no debt, and fears no grave;
Man would be mild, and with safe conscience blest.
Man must begin, know this, where Nature ends;
Nature and man can never be fast friends.
Fool, if thou can'st not pass her, rest her slave."

FEEDING EXPERIMENTS ON DRAFT CATTLE[1]: II

By Antonio C. Sanchez

There has been little comparative study of the different native feeds and forages suitable as supplement to native pastures for work bullocks in the Philippines. Lago[2] reported that supplementing native pastures with corn, varying from two to three kilograms of grain a day, for work bullocks of about 375 kilograms in weight, did not give any appreciable good effects (August 25, 1917, to October 19, 1917; October 20, 1917, to December 14, 1917; December 15, 1917, to January 14, 1918); of sugar cane and corn fodder used as supplements to native pasture, corn fodder was better than the Japanese cane, (using the whole plant; period of experiment, March 16, 1918, to April 26, 1918); and that Guinea grass (*Panicum maximum* Jacq.) was slightly better than corn fodder (August 17, to September 28, 1918).

The writer presents the following results of his study on the effect (1) on the weight, health, and ability to endure work of work bullocks on native pasture supplemented with shelled corn, compared with native pasture alone; (2) of native pasture supplemented with Guinea grass, compared with native pasture alone; and (3) of native pasture supplemented with copra meal, compared with native pasture alone.

These experiments were conducted at the College of Agriculture, University of the Philippines, Los Baños, Laguna, and covered a period of almost one year (235 days).

GENERAL PLAN

THE BULLOCKS

The animals used in this work were ten draft bullocks selected from the College herd. They were divided into two uniform lots of five animals in each lot. The animals of one lot were to receive one kind of supplemental feed in addition to what they could get in the pastures and those of the other lot were to depend entirely on what they could get in the pastures and the uncultivated and grassy lots of the College Farm. The animals from both lots were arranged in such a way that they could be worked in teams of two animals each. Each team was composed of animals from both lots, thus giving the animals the same kind of labor for the same length of time.

The ten bullocks were scheduled to work every day during the week, except Sunday, from half-past seven to eleven o'clock in the morning and from one o'clock to four o'clock in the afternoon. Exception was made when the weather did not permit work or when there were no laborers to handle the animals.

The bullocks were divided into two uniform lots as determined by the average weight of each animal for three successive weekly weighings. The initial weight of each animal was determined by taking the average weight of the animal one week before the beginning, at the beginning, and one week after the beginning

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1 Thesis presented for graduation from the College of Agriculture, No. 158; Experiment Station contribution No. 131.

2 Lago, Francisco. Feeding experiments on draft cattle. **The Philippine Agriculturist 8**:79-91. 1919.

of the experiment; likewise the final weight was found by taking the average weight of the animal one week before closing, at the closing, and one week after the close of the experiment. The animals from both lots were weighed every week at about eight o'clock in the morning, before they were put to work.

The ten native bullocks used were carefully selected from the herd of work cattle of the College. They were almost uniform in size and age and could be used in teams of two animals each. As they had been properly cared for before the experiment and received excellent care during the study the bullocks were in good condition throughout the period of observation.

PLAN OF FEEDING

The general plan of feeding the bullocks in Experiments I, II and III was the same throughout. At eleven o'clock in the morning, whenever the animals were used, animals belonging to Lot I of each experiment were given the supplemental feed and those in Lot II were pastured in the grassy and uncultivated lots of the College Farm and left there until one o'clock. They were put to work again till four o'clock in the afternoon. Animals in both lots (I and II) were let loose in the same pasture for the night. The supplement given to each animal was weighed before giving; that which was left uneaten was weighed after each feeding. The animals from both lots were always given water after they were removed from the stable and pastures at one o'clock, just before putting them to work.

THE PASTURE

Of the six pastures of the College, the two known as Tungtungin and Pagitan were the ones used throughout the experiments. The grass areas are traversed by creeks where the animals could easily get access to water. The rest of the herd of work cattle were also in these pastures, grazing with the bullocks used in these experiments. The vegetation of the pastures, however, was properly maintained by transferring the animals from one pasture to another so as to avoid depleting the supply of feed (see Table I).

TABLE I.—*College native pastures.*

Name of place.	Vegetation [a]
Tungtungin	*Imperata cylindrica* (L) Beauv.
	Saccharum spontaneum L.
	Andropogon halepensis (l.) Brot.
	Leucaena glauca (l.) Benth.
	Paspalum conjugatum Berg.
	Rottboellia exaltata L. f.
	Mimosa pudica L.
Pagitan	*Imperata cylindrica* (L.) Beauv.
	Paspalum conjugatum Berg.
	Saccharum spontaneum L.
	Andropogon halepensis (L.) Brot.
	Rottboellia exaltata L. f.
	Mimosa pudica L.
	Panicum sp.
College Farm	*Paspalum conjugatum* Berg.
	Imperata cylindrica (L.) Beauv.
	Saccharum spontaneum L.
	Rottboellia exaltata L. f.
	Panicum sp.
	Panicum flavidum Retz.
	Digitaria consanguinea Gaudich.
	Desmodium triflorum (L.) DC.
	Panicum colonum L.

[a] Arranged according to their relative abundance, as identified by Mr. N. Catalan of this College.

EXPERIMENTS AND RESULTS

EXPERIMENT I

Object.—The object of this experiment was to compare native pasture supplemented with corn (shelled) with native pasture alone.

Plan of the experiment.—This experiment was started on August 30, 1920, and lasted 85 days.

Lot I was given corn grain in addition to pasture.

Lot II was pastured.

At eleven o'clock in the morning whenever the animals were used, bullocks belonging to Lot I (Corn Lot) were brought to the stable and fed corn grain varying from one to five kilograms to the head.

The grain used.—Native Yellow Flint corn from the Department of Agronomy was used. The quality of the corn used throughout the experiment was poor as the corn was rather old and about 25 per cent of the kernels were attacked by corn weevils.

The pasture.—Most of the grass in the pasture was mature, but the rest of the vegetation was still good and palatable to the animals (see Table II).

Table II shows that Lot I (with grain supplement) had a total decrease of —11.0 kilograms or an average of —2.21 kilograms an animal. Lot II showed a total decrease of —48.34 kilograms or an average of —9.67 kilograms an animal.

These figures show that corn grain as supplement to native pasture was only slightly better than pasture alone. This corroborates Lago's results.

EXPERIMENT II

Object.—The object of this experiment was to compare native pasture supplemented with Guinea grass with native pasture alone.

Plan of the experiment.—This experiment was begun on May 16, 1921, and lasted 80 days. With the exception of bullock Abuhin of Lot I and Barroso of Lot II, the same animals were used as in Lots I and II of Experiment I. Pedro and Felipe were substituted for Abuhin and Barroso, respectively.

Lot I was fed Guinea grass in addition to pasture.

Lot II was pastured.

At eleven o'clock whenever the bullocks were used, a fresh supply of Guinea grass was given to the animals in Lot I in the stable, and those in Lot II were pastured in the grassy and uncultivated lots of the College Farm. The amount of Guinea grass given to each animal in the stable was recorded and any amount left uneaten was weighed and deducted from the total amount given. They were fed as much as 11.6 kilograms each time.

Feeds used.—The Guinea grass used in this experiment was taken from a field of Guinea grass on the College Farm. It was in the early part of the rainy season of this locality when this experiment was conducted. The condition of the Guinea grass and of other grasses of the College Farm was good.

The pasture.—The same pastures used in Experiment I were used in this experiment. The vegetation was abundant and succulent, as it was in the early part of the rainy season of this locality when this test was carried out (see Table II).

Table III shows that both lots increased in weight, the Guinea grass lot, 18.34 kilograms or an average of 3.67 kilograms, and the pasture lot, 33.78 kilo-

grams or an average of 6.76. The total amount of Guinea grass fed was 678.60 kilograms.

It was observed that the bullocks relished the Guinea grass, but as soon as the stalks became mature, consequently hard and coarse, the animals refused to eat the greater part of the stalks.

The animals in both lots depended entirely upon roughage as their source of food supply. Animals in Lot II had a greater increase in weight than those in Lot I, apparently because they had a better chance to secure a variety of feeds in the pastures than those in Lot I which were fed in the stable with Guinea grass. Animals from both lots increased in weight except Kaiser of Lot I and Dupong of Lot II.

There seemed to be no advantage in supplementing native pastures with Guinea grass for working bullocks when they are in good condition.

EXPERIMENT III

Object.—The object of this experiment was to compare native pasture supplemented with copra meal with native pasture alone.

Plan of the experiment.—On August 22, 1921, this experiment was begun and it was closed on October 3, 1921, covering a period of 70 days.

Lot I was fed copra meal in addition to pasture.

Lot II was pastured.

At eleven o'clock in the morning whenever the animals were used, animals in Lot I were given copra meal which ranged from about one to one and one-half kilograms a head. The copra meal was given in wet mash and so any amount left unconsumed was not weighed because of the addition of water. The feed was always dusted with salt, so as to increase its palatability. Animals in Lot II were pastured in the grassy and uncultivated lots of the College Farm.

Feeds used.—The copra meal used in this experiment was fresh and of good quality.

The pasture.—The same pastures used in Experiments I and II were used in this test. Most of the grasses were rather mature, but the rest of the vegetation was good and succulent. (see Table IV).

From the results from both lots as given in Table IV, it may be seen that the copra lot had the greater decrease in weight, —23.23 kilograms, or an average of —4.64 kilograms an animal, while the pasture lot had a decrease of —14.19 kilograms or an average of —2.84 kilograms an animal.

Copra meal was not palatable to these animals; hence, they could not consume much of this feed. The grasses in the pastures were mature and coarse during this experiment.

It is apparent that in maintaining the weight of work animals giving copra meal as a supplement to native pasture did not give any advantage over native pasture alone that was in a relatively poor condition of vegetation.

SUMMARY OF CONCLUSIONS

1. Under the present test, shelled corn fed in amounts varying from one to five kilograms a head, as supplement to native pastures, proved to be a little better than poor stand native pastures alone in maintaining the weight and health of work bullocks.

2. Guinea grass, varying from 4 to 11.6 kilograms a head as supplement to native pastures did not show any special advantage over well conditioned native pastures alone, in maintaining the weight, vigor and health of work bullocks.

3. Copra meal, ranging from one to one and one-half kilograms a head, as a supplement to native pastures, did not show any advantage over poorly vegetated native pasture alone, for maintaining the weight, health, and working ability of work animals. Copra meal was not palatable to these animals.

ACKNOWLEDGMENT

The writer wishes to express here his obligations to Professor B. M. Gonzalez, Head of the Department of Animal Husbandry, and to Mr. M. Mondoñedo, Instructor in Animal Husbandry, for their valuable suggestions and criticisms during the progress of the experiments.

TABLE II.—*Summary table of weights and feed given.*

	Lot I (Corn Lot).				Lot II (Pasture Lot).				
	Initial weight.	Final weight.	Gain.	Loss.		Initial weight.	Final weight.	Gain.	Loss.
1. Animals:	*kg.*	*kg.*	*kg.*	*kg.*	1. Animals:	*kg.*	*kg.*	*kg.*	*kg.*
Kaiser	492.42	485.60		—6.82	Lucio	489.39	463.03		—26.36
Juan	412.57	426.82	+14.25		Maximo	440.00	428.33		—11.67
Pintaro	472.12	472.87	+.75		Malukong	423.03	421.21		—1.82
San José	408.18	406.36		—1.82	Barroso	466.06	453.03		—13.03
Abuhin	373.47	356.05		—17.42	Dupong	364.55	369.09	—4.54	
2. Total	2158.76	2147.70	+15.00	—26.06	2. Total	2183.03	2134.69	—4.54	—52.88
3. Difference				—11.06	3. Difference				—48.34
4. Average	431.75	429.54		—2.21	4. Average	436.61	426.94		—9.67
5. (a) Total feed eaten = 348.60 kg.					5. (a) Total feed eaten				
(b) Average feed eaten = 69.72					(b) Average feed eaten				
6. Number of days of experiment = 85[a]					6. Number of days experiment = 85[a]				
7. (a) Total days worked = 225					7. (a) Total days worked = 225				
(b) Average days worked = 45					(b) Average days worked = 45				

[a] August 30, 1920, to November 22, 1920.

TABLE III.—*Summary table of weights and feed given.*

Lot I (Guinea grass Lot).

	Initial weight.	Final weight.	Gain.	Loss.
1. Animals:	*kg.*	*kg.*	*kg.*	*kg.*
Kaiser	489.70	479.24		—10.46
Juan	422.57	427.24	+4.67	
Pintaro	473.03	482.72	+9.69	
San José	432.73	438.78	+6.05	
Pedro	400.39	408.78	+8.39	
2. Total	2218.42	2236.76	+28.80	—10.46
3. Difference			+18.34	
4. Average	443.68	447.35	+3.67	

5. (a) Total feed eaten = 678.60 *kg.*
   (b) Average feed eaten = 137.70
6. Number of days of experiment = 80 [a]
7. (a) Total days worked = 210
   (b) Average days worked = 42

Lot II (Pasture Lot).

	Initial weight.	Final weight.	Gain.	Loss.
1. Animals:	*kg.*	*kg.*	*kg.*	*kg.*
Lucio	453.78	467.12	+13.34	
Maximo	410.16	447.87	+37.71	
Malukong	430.60	434.09	+3.49	
Felipe	422.88	429.24	+6.36	
Dupong	390.30	363.18		—27.12
2. Total	2107.72	2141.50	+60.90	—27.12
3. Difference			+33.78	
4. Average	421.54	428.30	+6.76	

5. (a) Total feed eaten
   (b) Average feed eaten
6. Number of days of experiments = 80
7. (a) Total days worked = 210
   (b) Average days worked = 42

[a] May 16, 1921, to August 3, 1921.

TABLE IV.—*Summary table of weights.*

Lot I (Copra meal Lot).

	Initial weight.	Final weight.	Gain.	Loss.
1. Animals:	*kg.*	*kg.*	*kg.*	*kg.*
Kaiser	494.09	491.62		—2.47
Juan	423.33	421.82		—1.51
Pintaro	478.18	484.09	+5.91	
San José	432.12	419.09		—13.03
Pedro	408.79	396.66		—12.13
2. Total	2236.51	2213.28	+5.91	—29.14
3. Difference				—23.23
4. Average	447.30	442.66		—4.64

5. Number of days of experiment = 70 [a]
6. (a) Total days worked = 225
   (b) Average days worked = 45

Lot II (Pasture Lot).

	Initial weight.	Final weight.	Gain.	Loss.
1. Animals:	*kg.*	*kg.*	*kg.*	*kg.*
Lucio	469.24	465.15		—4.09
Maximo	445.45	437.27		—8.18
Malukong	429.09	422.72		—6.37
Felipe	426.36	418.48		—7.88
Dupong	363.42	375.75	+12.33	
2. Total	2133.56	2119.37	+12.33	—26.52
3. Difference				—14.19
4. Average	426.71	423.87		—2.84

5. Number of days of experiment = 70
6. (a) Total days worked = 225
   (b) Average days worked = 42

[a] August 22, 1921, to October 30, 1921.

RICE ON COGON SOIL WITH AND WITHOUT TREATMENT[1]

By Quirico F. Abrajano

INTRODUCTION

PROBLEM

There are in the Philippines extensive areas covered with cogon (*Imperata cylindrica* Linn.) which might be devoted to rice growing. Much of the cogon land that is on the hillsides is cleared up under the *caiñgin*[2] practice and planted to rice. A belief prevails that rice planted directly after cogon has poor growth and low production of both straw and grain, especially the first crop. It should be of interest to know what effect cogon has, if it has any, on the rice crop following it.

PREVIOUS WORK ON THE SUBJECT

Zamora (1), Balangue (2), Goco (3), Trelease and Paulino (4), Vibar (5), and Trelease (6), performed a number of experiments on the fertilization of upland rice at this College. None of these, however, were carried out on cogon soils. The only work on cogon soil which has been reported, thus far, is that of Navarro (7), but he used corn instead of rice as the crop.

Navarro ran two sets of cultures using earthen pots holding five kilograms of soil each, as containers. In the first culture he used ammonia-leached soils, water-leached soils, burnt soils, and normal soils. Three pots were treated with metallic stimulants. In his first culture he used these chemicals, single and in combination: potassium nitrate, dicalcium phosphate, magnesium sulphate. In the second culture he used the following as fertilizers: chemicals, K_2SO_4, $NaNO_3$, Na_2HPO_4, $CaCO_3$, Na_2SiO_3; manures: stable manure and worm excrement. The conclusions reached in the experiment were that (a) lime was decidedly beneficial to the cogon soil; (b) that the cogon soil was deficient in nitrogen; and (c) that the application to stable manure resulted in much more active growth.

OBJECT OF THE PRESENT WORK

The objects of the present experiment were, (1) to determine the effect, if there is any, on the production of straw and grain, of cogon plant preceding the rice crop, and (2) to find the treatment of the soil that would best improve its productiveness.

TIME AND PLACE OF THE PRESENT WORK

This work was carried out during the rice season of 1921-1922 at the College of Agriculture, University of the Philippines, Los Baños, P. I.

MATERIALS

The soil used in the experiment was a silt loam and was taken to a depth of thirty centimeters from a cogon area. The soil was pulverized and then sampled for analysis.

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1 Thesis presented for graduation from the College of Agriculture, No. 159; Experiment Station contribution No. 132.

2 A *caingin* is a temporary clearing on which rice, corn, or vegetables are planted in a crude, primitive manner.

The containers were kerosene cans. To provide for drainage, holes were made in the bottom. About 18 kilograms of soil were put into each container.

The fertilizers used in the different treatments were lime, manure, kainit, dried blood, ammonium sulphate and double superphosphate. In addition, a crop of green manure and all plant residues, except when otherwise stated, were turned under.

Two crops were harvested. The variety of rice used was Tiniaong, bearing the College No. 9118F[3]. It is an early variety, maturing in about one hundred days. The seeds were obtained from the Agronomy Department. The seeds of mungo which was grown and turned under as green manure were obtained also from the same department.

EXPERIMENTS AND RESULTS

ANALYSES OF THE SOIL

Both mechanical and chemical analyses of the soil were made. In the mechanical analysis, the centrifugal method devised by the United States Bureau of Soils (8) was employed, and the size of particles for the separates was adopted.

In the chemical analysis, the total, instead of the acid soluble elements, was determined. The methods used were those employed at the Illinois Agricultural Experiment Station. The following elements were determined: nitrogen, phosphorous, potassium, calcium and magnesium. Moisture and organic matter were also determined. The soil gave an alkaline reaction. Table I shows the results of the mechanical and the chemical analyses.

TABLE I.—*Analyses of soil.*

Mechanical.			Chemical.		
Separates.	Size.		Elements and other constituents.		Kilograms per hectare.
	mm.	*per cent*		*per cent*	
Fine gravel	2–1	.35	Moisture	7.7	
Coarse sand	1–0.5	9.13	Organic matter	10.43[a]	
Medium sand	.5–.25	10.19	Nitrogen	.082	2050[b]
Fine sand	.25–.10	17.74	Phosphorus	.227	5675
Very fine sand	.10–.05	24.75	Potassium	.496	12400
Silt	.05–.005	30.25	Calcium	2.185	54625
Clay[c]	.005–9	7.59	Magnesium	1.667	41675

a Calculated on the free moisture basis.
b Calculated on the basis of 2500000 kilograms of soil to the hectare twenty centimeters deep.
c By difference.

CULTURE

The plan was to grow a crop of legume (mungo, *Phaseolus radiatus*, Linn) first, and then turn this under as a green manure. Five mungo plants were allowed to grow in each pot, and when the flowers began to appear they were all turned under. In some parts, the crop was dried before turning under. The crop was analyzed and found to contain 1.05 per cent nitrogen as calculated on the dry basis.

This crop of mungo was followed by the first crop of rice. The seeds were sown on August 5, 1921, and the crop was harvested on November 9 of the same year. The culture covered a period of ninety-six days. Four plants were allowed to grow in each pot. At harvest the height of the plants was recorded, and the fresh and dry weights of the straw as well as the weights of both fresh and dry heads and the weight of the grain were taken. Table II shows the result of the first crop.

The second crop of rice followed the first, but the soil was given different treatment. Lime, kainit, dried blood, ammonium sulphate, double superphosphate, and manure applied singly and in combination were used as fertilizers. The culture covered a period of ninety-five days. The treatment given to the soil and the data obtained from the crop are given in Table III.

DISCUSSION OF RESULTS

ANALYSES OF THE SOIL

The physical composition of the soil, a silt loam, showed that it is not heavy and would be easy to work with. Brown and Arguelles (9) made a mechanical analysis of some grass land on Mount Maquiling at the foot of which the College is situated and found the soil to be loamy clay.

The physical and chemical conditions of the soil are factors in soil fertility. A soil may be in good tilth, yet, if there is not enough available food a normal crop cannot be raised. On the other hand, a large stock of plant food in the soil may not produce a good crop if the physical condition is not suitable for the growth of the crop. Table I shows that, so far as physical composition is concerned, the soil under consideration should produce a good crop. But examination of the amount of some plant foods present reveals the fact that, at least one essential element is deficient. The amount of nitrogen for example, while seeming large, 2050 kilograms to the hectare, does not appear, as will be shown later, to be sufficient to meet the need of the crops. Potassium, too, does not appear to be plentiful in the soil, but phosphorus, calcium, and magnesium are high. The fact that the reaction of the soil was strongly alkaline indicates that calcium and other alkaline earth and alkali salts may be present in large quantities. Brown and Arguelles (9) also analysed, chemically, some of the grass lands on Mount Maquiling and found that they contain .15 per cent nitrogen, .12 per cent phosphorus, .61 per cent calcium, .37 per cent magnesium and .21 per cent potassium. These determinations however, being partial, are not comparable with the present data, which are total.

CROPS

First culture.—As stated, the first crop of rice followed the turning under of the mungo, as green manure. Three pots were set aside for control and 46 pots were planted to mungo. In five duplicates, the legumes were allowed to dry before turning under, while in the rest they were turned under fresh. The amount of green manure turned under when dried was 11.4 grams per pot and, when fresh, 51.63 grams per pot. In Table II are given the effect of this treatment of the soil on the growth and yield of straw and grain. The crops growing in pots with dried legumes turned under were superior in every case and in every respect to the untreated pots. On the other hand, those growing in the pots where fresh legumes had been turned under were generally superior to the crops

in pots with dried legumes. For the control, the average height was 71.47 centimeters; weight of dry straw, 16.95 grams; and grain, 9.41 grams. In pots with dried legumes the average height was 75.31 centimeters; weight of dry straw, 17.01 grams; and grain, 10.18 grams. In pots with fresh legumes the average height was 77.91 centimeters; weight of dry straw, 17.77 grams; and weight of grain, 11.00 grams. It is apparent from these figures that green manuring in this type of soil improves the growth and yield of both straw and grain of rice. The yield of grain was increased 17.4 per cent by the turning under of fresh legumes. This is in general agreement with the results obtained by Krauss (10), who found an increase of yield from poor paddies when treated with green manures. It may be added that the fresh legumes were more effective than the cured ones in improving the yield in this type of soil. This is because fresh legumes are more readily decomposed than the cured ones, thus making the plant available to the crops.

These results follow the common observation that rice grown immediately after the cogon has poor growth and low production of straw and grain.

Second culture.—Comparing the plants in control pots for the first and second crops (see Tables II and III) it will be seen that the first crop was much better in growth and production of straw and grain than the second. This difference shows the tendency of the succeeding crops to decrease and disproves, at least with the soil under experiment, the assertion that on cogon soil only the first crop of rice suffers from effect of the grass. The crop immediately following the first on soil without any further treatment was poor, much poorer than the preceding one. This indicates that the beneficial effect of the green manure was confined to the first crop, alone, and that in order to maintain or improve the yield of the succeeding crops, further appropriate treatment should be given to the soil. The interesting results on the rice plants from the various treatments given to the soil in this experiment are shown in Table III.

In the chemical analysis of the soil, the writer found that the nitrogen content was 0.082 per cent which, as stated before, is probably not sufficient to meet the demands of the crop. This statement was supported by the yield both of straw and grain. In general, the application of nitrogenous manure, either singly or in combination with phosphatic or potassic fertilizers, was accompanied by luxuriant growth and high yield of straw and grain. One exception was the treatment with ammonium sulphate (see Table III). When this chemical was applied either singly or in combination with lime and double superphosphate it injured, rather than improved, the productiveness of the soil. When applied alone, or in combination with double superphosphate, only a few grains were produced and the plants, though dark green in color, were so weak that they could not stand straight. And when nitrogenous manure was applied in combination with double superphosphate and lime the worst effect on the crop was obtained. The rice failed to grow more than twenty centimeters above the surface of the soil, and no grains were produced. This bad effect may have been due to the liberation of a large amount of ammonia the odor of which was noticed during the mixing of lime and ammonium sulphate.

The results with ammonium sulphate in this experiment are not in agreement with those of Trelease (6) and Goco (3). Both these investigators were working on two different types of soil from the College Farm. They found that

the high proportion of ammonium sulphate to another salt gave high yield of tops and grains. It is possible that the application of 140 grams of ammonium sulphate was too large a dose; but Vibar (5) using the same rate of application with another type of soil found ammonium sulphate to have increased, greatly, the production of rice straw and grain. Evidently, what is a good treatment for one type of soil is not necessarily good for another type.

Another exception to the good effect of nitrogenous manures on the rice crop was that of plant residues. Residues of a rice crop would naturally contain nitrogen besides the other plant foods obtained from the soil, and when turned under should furnish nitrogen to the crops. But results obtained from Pots 5 and 28 treated with residues, alone, did not give good yield. Plant residues, however, combined with kainit and double superphosphate gave a very high yield. The weight of grain obtained from pots with this combination was the third heaviest in the whole series. In combination with double superphosphate, kainit, and lime, it, also, gave high yields. These results led the writer to conclude that plant residues, alone, or in combination with kainit cannot improve the productiveness of the soil under investigation. On the other hand, when combined with some suitable materials, they may give increased production of rice.

The two other sources of nitrogen used in this experiment were horse manure and dried blood, both organic materials.

All pots receiving manure gave high yields. Balangue (2), using different kinds of chemical fertilizers and stable manure, found that for both lowland and upland rice, horse manure proved to be the best; the yield from pots receiving this manure being the highest.

With dried blood, the yields were generally the best, whether applied alone or in combination with phosphatic and potassic fertilizers. The tallest plant and the heaviest yield of grains were obtained from pots receiving dried blood and double superphosphate and dried blood and kainit.

The results of the nitrogen series plainly show that the soil under question readily responds to nitrogenous fertilization. This can lead to but one conclusion and that is that this soil is deficient in nitrogen, for while in some types of soil the use of ammonium sulphate proved to be beneficial it did not in this type. But even admitting it to be beneficial the use of ammonium sulphate for this or other types of soil experimented with at the College is not a practical proposition. The price of this fertilizer is ₱178.00 per ton short c. i. f. Manila (11). This price would prevent the cultivators of cogon lands from improving them with ammonium sulphate.

The organic sources of nitrogen proved to be the best for this type of soil, a fact which indicates the need of organic matter in the soil. Of the three organic materials used, dried blood proved to be the most efficient source of nitrogen. Vibar (5) found this to be true, also. From these results it would seem justifiable to recommend the use of dried blood for the improvement of cogon lands. But, again, the price of dried blood,—₱164.80 per short ton c. i. f. Manila (12)—, is beyond the means of cogon land cultivators. Such being the case, the question as to how the cogon land can be improved arises. The writer found that plant residues, alone, cannot improve it. If the planters use residues in combination with the fertilizers, furnishing elements lacking in the soil, such as potassium or

phosphorus, they would have to buy them in the market, and, as stated before, the price is higher than the average farmer can pay. But horse manure or other kinds of organic fertilizers are available for many planters, and if they would apply it to the land it would greatly improve the productiveness of the soil. If this is not possible still another means can be resorted to. It has been shown in this experiment that green manuring with this type of soil improved the yield of rice. Why should it not be practiced? Green manuring is not well understood in this country. While the yields obtained from such a practice are probably not so high as those obtained from the use of dried blood, they would certainly be much higher than the yields without the green manure treatment; and the cost of producing these better crops would be very low.

It may be seen in Table I that the potassium content of the soil used in this work is 0.496 per cent, which is rather low. It is not only low but it is probably usually in a form not available for plants. The results obtained from pots receiving kainit in combination with other fertilizing materials show that the soil responds to potassic fertilization. The second and third best yields obtained in the whole series were those from pots receiving kainit and dried blood; kainit and double superphosphate; and plant residues, respectively. These results, however, do not conclusively prove that the soil is deficient in potassium. It is likely that a large part of the potassium in the soil is in the unavailable form. In this case the question would narrow down to the treatment of the soil which would liberate the potassium salt or salts from the unavailable state. Such a treatment is found in the mixture of dried blood and double superphosphate. It can be said, then, that while the application of potassic fertilizer may increase the fertility of the soil in question, the maintenance or increase of organic matter in the soil would be more important and economical in the end.

The results obtained from the phosphatic fertilizer and of lime in combination with other fertilizers are so varied and inconsistent that to attempt to make any interpretation of them would be unwise. The analysis of the soil, however, shows that the phosphorus and calcium are very high, and they cannot be the limiting factors in this soil, but they may be present in the soil largely in unavailable forms, hence the crops raised may not be the maximum. The most important question then in the case of phosphorus is how to render it available in larger amounts to the crops at any time. We have seen in this experiment that dried blood and manure applied to the soil produced maximum crops even if no phosphorus or potassium is included. This means that with plenty of organic matter in the soil the phosphorus and potassium present are made available. Hence, the importance of maintenance or increase of organic matter in the soil.

SUMMARY AND CONCLUSIONS

The physical composition of cogon soil shows that other factors being favorable, it is fitted for the production of a good crop.

Chemical analysis revealed the fact that the phosphorus, calcium, and magnesium content of the soil are high, while the nitrogen and potassium content are rather low. Cultural results showed that while potassium is low and the soil responded to potassic fertilizers, potassium cannot be a limiting factor. Nitrogen, on the other hand, was deficient and was the limiting factor.

While with some types of soil investigated at the College, ammonium sulphate was beneficial to the crop, even with the rate of application used in the

present experiment, it proved to be injurious to the crop grown in the cogon soil under investigation.

Of the different sources of nitrogen applied to the soil, the organic kinds gave more satisfactory returns than the other sources. This shows that the soil is badly in need of organic matter.

Of the organic materials used, dried blood proved to be the most efficient, but it cannot be recommended for use by the cultivators of cogon lands because of its high price.

Cultural results showed that the rice crop following the cogon was poor, indicating that cogon preceding this grain has a bad effect on the rice, and confirming, at least in this experiment, the belief that rice immediately following the cogon has a poor growth and low production of straw and grain. Results further showed that the second crop of rice on the untreated soil was poorer than the first, thus disproving the claim that only the first crop suffers from the effect of cogon.

Green manure turned under improved the productiveness of the soil, the fresh plants being more effective than the dried.

Plant residues, alone, did not improve the yield of rice.

From the analysis of the soil, it was found that the organic matter content of the soil, 10.43 per cent, was rather high. This included the roots of cogon left in the soil. The fact, however, that the addition of organic materials to the soil resulted in the highest yield of rice, showed that a very large portion of this organic matter was present in an inert form. This matter was old roots and grass stems which decomposed too slowly to be used by the crops. That the soil may become highly productive, the addition of fresh organic matter should be made. Dried blood has been found to furnish this kind of organic matter but the price is so high that other organic materials must be used. If stable manure is available it should be used. If it is not available, green manuring should be resorted to. This was found to improve the productiveness of the soil under investigation and the writer believes that it will produce good results under field conditions. Green manuring is practiced with success in many countries, and there is no reason why it should not succeed in the Philippines. The writer suggests that it should be tried under field conditions.

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TABLE II.—*Result of first crop of rice.*

Series number.	Treatment.	Height.	Average weight of straw.		Average weight of head.		Average weight of grain.
			Fresh.	Dry.	Fresh.	Dry.	
		cm.	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*
1	Control	70.48					
22	Control	70.95	30.6	16.95	11.6	10.01	9.41
37	Control	73.00					
2 and 25.	Green manure	78.36	33.75	17.45	13.55	11.70	11.10
4 and 27.	Green manure	78.81	37.80	18.20	13.61	12.03	11.37
7 and 30.	Green manure	77.07	37.25	19.65	13.76	12.27	11.67
10 and 33.	Green manure	79.62	32.30	17.70	13.68	11.97	11.34
11 and 34.	Green manure	81.06	38.13	18.00	11.14	11.96	11.25
12 and 35.	Cured green manure	73.34	28.84	14.95	11.54	9.90	9.41
16 and 40.	Cured green manure	77.19	43.00	22.77	15.75	13.74	13.02
3 and 26.	Cured green manure	70.68	21.96	11.80	8.42	7.28	6.66
48 and 49.	Cured green manure	76.98	35.90	17.05	12.83	11.67	10.97
8 and 31.	Cured green manure	78.38	36.80	18.48	12.95	11.43	10.83
13 and 36.	Green manure	76.00	33.83	17.13	12.90	11.63	11.13
15 and 39.	Green manure	77.80	35.35	15.98	11.96	10.63	10.06
18 and 42.	Green manure	81.56	36.28	19.08	14.03	12.40	11.63
20 and 44.	Green manure	78.28	30.40	17.20	14.00	12.54	11.98
5 and 28.	Green manure	74.47	31.56	15.38	9.85	9.03	8.43
6 and 29.	Green manure	78.00	36.25	18.90	12.40	11.03	10.41
17 and 41.	Green manure	74.48	40.56	18.38	13.45	11.25	10.62
9 and 32.	Green manure	82.61	37.16	17.50	14.37	12.63	11.98
19 and 43.	Green manure	80.54	37.38	19.28	13.11	11.49	10.88
14 and 38.	Green manure	79.18	38.66	18.68	14.28	12.37	11.69
23 and 46.	Green manure	73.88	30.55	17.63	13.02	11.65	11.17
24 and 47.	Green manure	75.69	31.48	18.00	14.03	12.28	11.65
21 and 45.	Green manure	75.08	29.25	15.78	12.77	11.19	10.64

TABLE III.—*Result of second crop of rice.*

Series number.	Treatment. [a]							Average height.	Average weight of straw.		Average weight of head.		Average weight of grain.
	D. B.	K.	D. S. P.	L.	A. S.	M.	P.R.		Fresh.	Dry.	Fresh.	Dry.	
	gm.	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*		*cm.*	*gm.*	*gm.*	*gm.*	*gm.*	*gm.*
1.....	C	o	n	t	r	o	l						
22.....	C	o	n	t	r	o	l	62.64	23.96	10.80	8.48	7.52	6.66
37.....	C	o	n	t	r	o	l						
2 and 25.	140							85.80	107.25	59.98	31.15	27.08	19.42
4 and 27.	140	140						96.35	116.50	55.50	34.47	28.50	23.66
7 and 30.	140		140	140				93.29	116.70	60.00	30.15	27.10	22.06
10 and 33.	140	140	140	140				92.73	133.60	71.33	30.15	25.47	19.38
11 and 34.	140		140					96.06	116.15	72.28	36.50	32.30	24.83
12 and 35.	140		140	Cured mungo [b]				92.98	130.65	71.10	33.45	27.34	20.90
16 and 40.	140		140	140 Cured mungo [b]				82.93	99.65	49.33	29.80	25.35	21.39
3 and 26.	No further treatment [b]							66.29	22.92	11.14	7.60	6.52	5.67
48 and 49.	No further treatment [b]							67.88	26.45	10.71	9.43	7.98	6.90
8 and 31.	Cured mungo [b]					500		78.11	53.20	21.84	16.37	13.81	11.78
13 and 36.		140				500		78.03	47.43	20.35	16.09	13.43	11.50
15 and 39.		140	140			500		86.11	56.53	33.08	20.23	18.80	16.09
18 and 42.			140	140		500		88.91	67.43	32.76	28.18	25.23	22.53
20 and 44.		140	140	140		500		84.83	83.63	39.98	26.59	23.05	19.74
5 and 28.							P.R.	67.10	20.73	11.13	6.50	5.49	4.75
6 and 29.		140					P.R.	74.75	35.07	15.43	9.50	7.92	6.53
17 and 41.			140				P.R.	83.87	62.63	34.63	25.51	23.15	19.68
9 and 32.			140	140			P.R.	80.97	70.13	30.63	21.87	19.21	16.85
19 and 43.		140	140				P.R.	93.63	80.35	36.74	31.25	27.00	23.61
14 and 38.		140	140	140			P.R.	85.96	70.38	33.35	22.60	19.21	16.18
23 and 46.					140			71.68	49.92	25.96	12.70	9.20	6.90
24 and 47.			140		140			77.12	10415	64.99	7.30	5.62	.50
21 and 45.			140	140	140			Failed to grow more than 20 centimeters.					

a D. B.=dried blood; K=kainit; D.S.P.=double superphosphate; L=lime; A.S.=ammonium sulphate; M=horse manure; P.R.=plant residues.

b Cured mungo turned under before first crop.

A SURVEY OF POULTRY DISEASES IN LOS BAÑOS[1]

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In the early part of 1918, the writer started to keep a careful record of all chicken diseases occurring in the flocks at the College of Agriculture and in those of some private individuals in the immediate neighborhood. The causes of a great number of the diseases recorded are largely controllable. For this reason it was thought that the publication of the data on file, though incomplete, might be of practical value to poultry raisers.

Up to August, 1919, all post-mortem examinations were made by the writer and *Diseases of poultry* (1) was frequently consulted in the diagnosis of the cases. Since 1919, most of the dead birds brought to the Poultry Division for examination have been sent to the College of Veterinary Science, and copies of their autopsy reports kept for the files of this division. The work is being continued and it is hoped that a more extensive report on this subject may be published in the future.

DISEASES OF THE RESPIRATORY SYSTEM

Under this heading, all diseases affecting the nasal passages, the pharynx, trachea, lungs, and air sacs are included.

ROUP

This disease is locally known as *sipon*. It is one of the most common troubles among the fowls in Los Baños and has been for some time the principal cause of death of the young pure-bred fowls in the College. Sometimes roup is used to designate a simple cold or catarrh, but, specifically, the disease is a contagious catarrh. It is distinguished by a sticky discharge from the nostrils, and in most cases, this discharge collects in the nasal sinuses where it forms a cheesy mass causing a tumor-like swelling of the face beneath the eyes. During the early stages, the discharge is thin and watery, but after a few days becomes thick. The appetite is diminished, the wings droop, and in general appearance, the bird shows signs of depression and illness.

Very few of the affected individuals recover; some gradually become weaker and live for months, during which time they spread the disease. Roup is very common during the rainy season. Young fowls are much more susceptible than the mature ones. The causal organism of this disease is not very well known, and it is the subject of much controversy. It is probably spread from one individual to another in a flock through the particles of dried secretion in the air or through the contamination of the food and drinking water. Birds that are out of condition are more easily attacked than the vigorous and properly nourished individuals.

Prevention is the best treatment for this disease. Before introducing new birds into a flock, isolate them until you are sure that they will not develop it.

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[1] Experiment Station contribution No. 133.

The flocks that are already infected should be quarantined and care should be taken not to use any material that has been used in infected yards. Any bird showing symptoms of the disease should be isolated at once, and those that die should either be burned or buried deep. Individual treatment requires a great deal of time, hence is not practicable for ordinary stock. In case of expensive birds, however, it is advisable. The following recommendation of Harrison and Streit (2) was tried in this College and found successful when the disease was treated during its early stages. "The nostrils are pressed together between the thumb and the forefinger in the direction of the beak two or three times. Pressure should also be applied between nostrils and eyes in an upward direction. This massage helps to loosen the discharge in the nostrils and eyes. The bird's head is then plunged into a solution of permanganate of potash (1 to 2 per cent)[2] for 20 to 30 seconds, in fact the head may be kept under the solution as long as the bird can tolerate it. The solution is thus distributed through the nostrils and other canals and has an astringent and slight disinfecting action. This treatment should be given twice a day and continued until all symptoms have disappeared." A solution of creoline one-half to one per cent has also been tried with equal success.

AVIAN DIPHTHERIA

This is locally known as *sampaga*. It is common among the mature fowls. The specific causative organism of this disease is not yet definitely settled, as Moore (3), Marshall (4), Mack (5), and Jackley (6) each have failed to isolate it.

When the disease is in its early stage of development the affected birds appear to be in good condition, and cannot be distinguished from the non-infected individuals except by the presence of diphtheritic deposit on the mucous surface of the nostrils, eyes, mouth, throat, trachea, or bronchi. At first this deposit is thin and light in color, later it becomes thicker, firmer, and more adherent. This deposit is called a false membrane and has the appearance of a flower, hence its local name, *sampaga*. When removed, the mucous membrane beneath is seen to be inflamed, ulcerated, and bleeding. During the later stages of the disease, the inflammation extends to the adjoining surface, the breathing is obstructed, the bird swallows its food with difficulty, the eyelids are stuck together, and a characteristic foul odor is noticeable. The affected birds become weak, emaciated, and death follows.

The modes of infection are the same as with roup, and the same general preventive measures recommended under roup should be followed in guarding against diphtheria. Local treatment of the diseased parts with a disinfectant has been found effective. The false membranes are removed and the inflamed tissues painted with tincture of iodine, silver nitrate or a strong solution of hydrochloric acid, care being taken not to touch the healthy tissues as they are likely to become infected. Experienced keepers of game cocks claim that they have had success by treating these diphtheritic tissues with the solution resulting from dipping a copper coin in vinegar and allowing it to stand over night. This has not been tried in the College and hence is not recommended[3].

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[2] Words in parenthesis were inserted by the writer.

[3] When a copper coin is dipped in vinegar (acetic acid), acetate of copper is one of the substances formed. Copper acetate, used externally, is astringent, stimulant, and escharotic according to the strength.

PNEUMONIA

A number of cases of pneumonia were observed among the foreign breeds of fowls in this College, especially among the White Leghorns, during the hot days of August and September 1922. Pneumonia is an older stage of congestion of the lungs which is "caused by chilling the surface of the body." (1) It is very probable that the affected birds got chilled by being rained on suddenly after having been exposed to the very hot sunshine, as during those months the weather was very uncertain.

The affected birds look dejected, they breathe rapidly, are indisposed to move, and show general signs of total depression. The wings droop, the plumage is ruffled, and the comb becomes dark. There is a profuse salivation, and because of this, the bird breathes with great difficulty. On postmortem examination, it was found that the tissues were dry and the skin closely adherent to the muscles. The lungs were dark in color and solid and when a piece was dropped into water it sank[4].

All of the attempts to treat the affected birds in the College were futile. As a preventive measure the flocks should be kept in good condition, and exposure prevented by providing plenty of shade for the poultry yards. Individual treatment is too laborious to be a very unprofitable undertaking.

DISEASES OF THE REPRODUCTIVE ORGANS

EGG BOUND

This trouble is very common, especially among pullets that are just beginning to lay. The bird is unable to pass the egg in the normal way from the oviduct. This difficulty may be due to the egg being too large and the passage not being sufficiently dilated as in the case of young pullets; the oviduct may be inflamed; or there may be a stricture in the passage. Some eggs, particularly pullet eggs, show streaks of blood on the shell. This indicates difficulty of passage through the last portion of the oviduct. The affected bird is restless, and she makes frequent trips to the nest attempting to lay. Later she becomes exhausted and stays in the nest. The plumage is ruffled and the bird shows all the signs of being sick. Several cases have been recorded when the bird was found dead in the nest.

Ward and Gallagher (7) recommend holding the affected fowl, vent downward, over steaming water for a time and then placing the bird in the nest. Helping the bird to lay by inserting the forefinger through the vent until the egg shell is felt, the fingers of the other hand pushing the egg to the direction of the vent guided by the inserted finger has been tried in the College but with only partial success. In cases where the oviduct is affected, either inflamed, twisted or stricted, treatment is not practicable.

BROKEN EGG IN OVIDUCT

A large number of hens have been observed to have broken eggs in the oviduct. The eggs may break either before or after the shell has been formed. The bird is restless and the feathers around the vent become moistened with the albumen from the broken egg in the oviduct. All of the cases recorded in the College were Native hens. These fowls are semi-wild and it is very probable that

[4] The autopsies were made by Dr. A. K. Gomez of the College of Veterinary Science.

because of their being nervous, they are easily frightened and any such a disturbance is enough to break an egg in the oviduct. Some of the affected hens were saved by removing the remnants of the egg from the oviduct.

ABDOMINAL YOLK CONCRETIONS

A number of hens examined were found to contain putrifying egg yolks in the abdominal cavity. The yolks may have failed to fall into the oviduct, or they may have been aborted into the abdominal cavity by a reverse peristaltic movement of the oviduct due to some inflammatory changes in the walls of this organ. The material is partially absorbed, and the unabsorbed portion decomposes in the peritoneal cavity. This condition can hardly be noticed during the early stages of decomposition. The bird becomes weak and depressed and death due to auto-intoxication follows. In all of the cases examined, the convolutions of the intestines were cemented together by this decomposing egg yolk. Sometimes the bird so affected can be detected by the foul odor coming out of the vent, but this occurs only at the last stages of the trouble. Control, therefore, is impractical.

ABNORMAL EGGS

Abnormal eggs may be produced by fowls because of some pathological conditions of the oviduct.

Soft shelled eggs.—These may be produced because of the lack of shell materials in the diet, by feeding condiments, or they may be actually aborted, due to the fowls having been driven or frightened.

Small yolkless eggs.—Eggs like these are locally known as *ipot.* These may be produced any time. They are popularly thought to have been laid by cocks, but such a belief is entirely erroneous. When the hen is in a very active laying condition, any foreign body, no matter how small, will cause a stimulation of the oviduct, the albumen glands begin to function, and the enclosed body is passed through the different regions of the oviduct as an ordinary egg.

Double-yolked eggs.—Unusually large eggs have been sent to the College for examination, and found to contain double yolks. These have been observed to be very common also in duck eggs. This condition may be due to any one of the following: (a) Two ova dropping together into the oviduct; (b) the first yolk being delayed at any point in the oviduct: (c) the first yolk being returned by reversed peristalsis; (d) the first yolk having been dropped into the body cavity and picked up by the oviduct shortly after the ovulation of another yolk. These two yolks then pass through the different sections of the oviduct in the ordinary way.

DISEASES OF THE ALIMENTARY TRACT

DIARRHOEA

In this discussion, all troubles of the intestines causing a watery discolored discharge are included under the general term, diarrhoea. The birds are inactive, and during the early stages the combs are pale turning dark purplish-red later. The feces are very watery and vary from whitish to greenish brown or red in color. When examined, the liver and spleen are usually enlarged and the intestines are inflamed and filled with mucus.

As this disease may be caused by a bacterial infection coming from filthy conditions, cleaning the surroundings should be the first step taken in prevention.

Intestinal parasites may also cause severe diarrhoea. No attempt has been made to treat this disease in this College, but Ward and Gallagher (7) recommend the following treatment: "Where only a few birds are affected they should be given 2 teaspoonfuls of castor oil each. The entire flock may be given Epsom salts if necessary in proportion of ⅓ to ½ teaspoonful to each grown fowl. The salts may be mixed in a mash to be fed early in the morning. If suspicion points to the feed as the cause of diarrhoea it should be changed or fed in smaller amounts combined with other feeds." Ground charcoal is a very good intestinal corrective, and this should be so placed that it is accessible to all the birds at any time.

DROOPING ABDOMEN

A Barred Plymouth Rock hen was observed showing an unusually pendant abdomen, that almost dragged on the ground when the bird was in a standing position. This hen had not laid even one egg although she appeared to be in a very healthy condition. The skin of the abdomen was bare of feathers. The bird was sent to the Veterinary College and was operated upon. It was found that this hen had an intestinal hernia. The pendant skin was removed, care was taken to place the gizzard and intestines as nearly as possible into the normal positions, and the wound was sutured. After a few days the wound healed and the bird looked like an ordinary normal hen. As a preventive from this kind of trouble, restrict fat forming foods in the diet.

ENLARGED CROP

Several cases were observed where the birds had unusually enlarged, pendulous crops. This condition apparently did not inconvenience the individuals. Its probable cause is overfeeding at irregular intervals. Treatment is not practical unless it is a case where a valuable bird is involved, in which case it can be remedied by operation, removing a part of the enlarged crop and then sewing the two edges together.

INDIGESTION

This trouble arises from overfeeding with hard dry grain. The birds become dull and listless and are prone to sit on the roosts. Occasionally the appetite becomes ravenous. General cleanliness of the premises, feeding the birds well-balanced rations, and allowing them access to ground charcoal are recommended as preventives.

DISEASES OF THE CIRCULATORY SYSTEM

FOWL CHOLERA

Near the end of the year 1919, an epidemic of fowl cholera broke out in the College flock. Nearly all of the pure-bred birds and many of the native chickens died. The Cantonese and the Cantonese grades with the Native were the only fowls not seriously affected. Once in a while, small outbreaks of this disease are reported around the College.

The excrement of the birds affected is highly colored yellow and green, sometimes occurring together and sometimes separately. The bird isolates himself from the crowd, the feathers are roughened, and the wings droop. There is intense thirst, and generally there is a severe diarrhoea. In some cases, the bird lives several days, but in acute cases, it dies within twelve hours after infection.

Cases have been observed when an apparently healthy bird would go to roost in the evening and be found dead the following morning.

Upon examination, the heart, in almost all cases, is dotted with punctiform hemorrhages and on the liver are found whitish punctiform areas of dead tissues. The intestines contain a pasty mass which may be creamy, green or brownish-red in color.

Individual medication is not advisable, and the immediate disposal of all sick birds is recommended. Strict sanitation should be observed to prevent further ravages of the disease.

FOWL TYPHOID

Fowl typhoid and fowl cholera have many external symptoms in common, and one is often mistaken for the other. Moore (8) differentiates these two diseases as follows:

FOWL CHOLERA	*FOWL TYPHOID*
1. Duration of the disease from a few hours to several days.	1. Duration of the disease from a few hours to several days.
2. Elevation of temperature.	2. Elevation of temperature.
3. Diarrhoea.	3. Diarrhoea.
4. Intestines deeply reddened.	4. Intestines deeply reddened.
5. Intestinal contents liquid, muco-purulent, or blood-stained.	5. Intestinal contents normal.
6. Heart dotted with eccymosis.	6. Heart usually pale and dotted with grayish points, due to cell infiltration.
7. Lungs affected, hyperemic or pneumonic.	7. Lungs normal, excepting in modified cases.
8. Specific organisms appear in large numbers in the blood and organs.	8. Specific organisms comparatively few in the blood and organs.
9. Blood pale (cause not determined)	9. Blood pale, marked diminution in the number of red corpuscles.
10. Condition of leucocytes not determined.	10. Increase in the number of leucocytes.

The liver of the diseased bird is generally enlarged, and the spleen is sometimes also enlarged, dark colored and pulpy.

Prevention is the best treatment. Avoid the introduction of diseased birds on your premises, and if the disease appears in the flock, separate the diseased birds from the flock at once. Maintain sanitary condition of the surroundings.

ENLARGEMENT OF THE HEART

A White Leghorn rooster of the College flock was found dead one morning. There was no apparent cause for its death. The bird was healthy in appearance; had a good appetite; indeed there was not the slightest sign to show that the bird had been ill. When examined, the heart was found abnormally large and pale

and blood clots were found in the larger blood vessels. The other internal organs were apparently normal. The cause of this trouble is not known and as it is not generally recognized while the bird is alive, no treatment can be recommended.

DISEASES OF THE NERVOUS SYSTEM

LIMBERNECK

This condition is a symptom of several diseases. Quite a number of cases of limberneck were observed and recorded by the writer. The muscles of the neck lost control partially or completely. The bird became dull, inactive, and its feathers ruffled. The neck was twisted, turned towards the tail and could hardly be lifted. Leg weakness developed and when the bird moved, it staggered. The bird became emaciated probably because of its inability to pick up its food in the later stages of the disease. Because the head always points towards the tail, the feathers around the base of the neck upon which the head rests became wet with secretions from the mouth.

Ptomaine poisoning usually causes limberneck. In several of the cases noted in the College, the birds were badly infested with intestinal worms. Limberneck is also caused by feeding on maggots from decaying meat. Inasmuch as limberneck is a symptom accompanying several diseased conditions no treatment can be recommended. As a preventive, however, the birds should not be allowed access to decaying meat.

DISEASES OF THE SKIN

CHICKEN POX

This disease is locally known as *bulutong*. It is very contagious, and observations at the College lead to the conclusion that only chicks up to six weeks old or younger are commonly affected. No case was recorded where a mature fowl was attacked. It has been demonstrated by various investigators that chicken pox, roup, and avian diphtheria are only different stages of the same disease and all are caused by filterable virus, the nature of which is not well known. However, while no positive conclusions have yet been drawn as to the cause of chicken pox, its contagious nature is not unknown.

The disease localizes itself in the form of wartlike nodules on the unfeathered parts of the head. At first these nodules are flat, but, later, they become prominent, some individual nodules attaining the size of an average pea. Sometimes the whole head is inflamed, and very often the eyelids of the chicks attacked become swollen and become stuck together. The nodules during the later stages become covered with a red-brown crust which sloughs off in case the attack is not very serious. It was observed that recovery without treatment took place within about two weeks. In case of severe infection, the eyes may become closed and the birds die of exhaustion, not being able to see to eat.

Prevention is the best treatment. If there are only a few valuable individuals infected, these should be isolated and treated singly. The following treatment recommended by Pearl, Surface, and Curtis (1) has been followed at the College with fair results. "The crust or nodules should be removed and the place treated with creoline (2 per cent solution) or corrosive sublimate (1/1000)..... and dusted with iodoform." Tincture of iodine applied after the crust was removed and treated with creolin was also used with fair success.

The use of chicken pox vaccine is not advisable in this country for the present as the expense involved in its preparation does not warrant its use. Furthermore, as the individuals attacked are limited only to the young stock, the loss to the owner is not very heavy.

DISEASES OF THE ABDOMINAL VISCERA

TUBERCULOSIS

Avian tuberculosis is not of uncommon occurrence in this locality. This is a disease which involves not only one of the visceral organs but all of them. In the cases on the College records, a majority of the lesions were found on the liver and small intestines. The rest of the visceral organs were less affected.

Extreme emaciation is manifested in the later stages of the disease. During the early stages, the affected bird is indisposed to move about, the feathers become ruffled, the eyes bright and starry, and the appetite becomes ravenous. In many cases, diarrhoea is present, and because of this, the feathers around the vent become soiled with feces. Lameness is another symptom that may arouse suspicion. None of these, however, is specific as to the presence of the disease. On postmortem examination in ninety per cent or slightly over of the cases reported the liver of the birds affected was found to be spotted with numerous raised nodules. The intestines and the mesenteries were also found dotted with these tubercles. In a less number of cases, the spleen was greatly enlarged and contained nodules similar to those found on the liver. The kidneys, lungs, heart, and ovaries were less often involved.

The cost of preparing and administering tuberculin, a vaccine which has been found effective in testing the presence of tuberculosis in fowls by Van Es and Schalk (9), by Beach, Hastings, and Halpin (10), and by Beach (11), makes its use in this country impracticable at present. Individual treatment should not be attempted. The birds that have died or that have been killed because of the disease should be disposed of immediately, either by burning them or by burying them deep in the ground. The utensils and the premises should be thoroughly cleaned and disinfected to prevent further losses from the flock.

INTESTINAL PARASITES

TAPE-WORMS

These parasites are long, flat, white, segmented worms. They are quite common in chickens in Los Baños. The majority of the cases we have on record are young birds; the mature fowls do not seem to suffer very much from the infestation of these worms. Unless they are present in large numbers, the mature birds do not seem to mind them. The infested individuals become emaciated, although the appetite remains practically undisturbed. In bad cases of infestation, the animals become dull and sleepy and isolate themselves from the rest of the flock. The sick animals seem to develop a craving for water. The feces are thin and passed out in small amounts but at close intervals. Careful examination will reveal the presence of segments of worms in the feces of affected birds.

Rotating the grounds at least once every two or three years is one of the best preventive measures recommended against tape-worms. If the flock is already infested, the excreta should be removed daily from the houses and any parasites or their eggs which may be in it destroyed by mixing it with quicklime or saturating it with a ten per cent solution of sulphuric acid. The diseased birds, if treated

individually, should be isolated and all of their droppings either burned or treated with a solution of sulphuric acid as recommended above. Powdered areca-nut given in pills is recommended as it has been found very effective.

ROUND-WORMS

In addition to tape-worm infestation, nearly all of the chickens examined were found harboring round-worms. There were, however, few cases in which the death of the fowl could be traced directly to the presence of these worms in the intestines. These worms are long, white, and cylindrical, varying from a centimeter or less to even more than ten centimeters in length. Under ordinary conditions, the presence of round-worms does not cause any more trouble to the chicken than a slight lowering of its vitality, but in severe infestations, they cause irritation of the intestines and produce diarrhoea. Sometimes they form into rather large balls and obstruct the passage of food through the intestines. Round-worms produce symptoms similar to those of tape-worms. The comb of the affected individual becomes pale, and, in severe cases, there may be diarrhoea. The feces may be streaked with blood.

The following treatment has been found efficient in the work with the College flock, especially with chicks. Green tobacco leaves were chopped fine and soaked in water. The steep-water and the leaves were mixed with mash and fed to the birds in the afternoon. Dried tobacco leaves were also tried and produced good results. Tobacco dust mixed with the mash in the proportion of three to five parts per one hundred of mash also produced satisfactory results.

EXTERNAL PARASITES

LICE

Lice do no serious harm to adult fowls which may harbor quite a number of these parasites without showing any symptoms of illness from their presence. When the young fowls are infested, they are very much irritated, and they lose condition and become more susceptible to other diseases. The lice can be easily found either under the wing or around the vent. When a bird is badly infested, these lice will be seen crawling on the hands after handling the bird a minute or two.

The birds should be allowed access to a dust bath. The surroundings should be kept sanitary and the birds given a dry range. Ordinary commercial sodium fluoride worked into the feathers of the infested birds has been found effective in freeing them of these parasites. The following insect powder was prepared by the writer and found effective if the preparation was applied when fresh. Take three parts of gasoline and one part of creolin, mix together and to it add enough plaster of paris to take up all the moisture. Powder the bird under the wings, in the fluff around the vent and on the ventral side of the body and shake after a lapse of several minutes after the application. Greasing with lard or vaseline around the vent, on the head, and under the wings, although somewhat tedious, is also very effective for lice, especially in young chicks. Several treatments are necessary to rid the chickens of these pests.

MITES

Mites are just as common as lice among chickens in this locality. Setting hens are very much annoyed by them, and small chicks, especially the hen-hatch-

ed ones, suffer considerably from the infestation of these parasites. The young chicks lose their vitality, become emaciated, and become more susceptible to other forms of troubles.

Cleanliness, dryness, good ventilation, and plenty of sunlight are very good preventives. Pearl, *et al* (1) recommend several kinds of sprays, but these have not been tried in this College.

SCALY LEG

Scaly leg is another disease caused by mites burrowing under the scales of the legs and feet. The shank becomes very much enlarged and roughened, and, in serious cases, the bird affected may become lame. This disease used to be very common in the College flock, but it was eradicated by using the following treatment: The crusts were removed carefully after soaking the shanks in warm soap suds. After brushing off the crusts, the cleaned portions were coated with creolated vaseline. To prevent the spread of the disease, care was taken not to use infested hens for hatching. Dipping the legs in kerosene is another treatment that has proved successful.

OTHER DISEASES

BUMBLE FOOT

This trouble is not very common among chickens in this locality. It is an abscess of the foot, but the swelling may include the lower region of the shanks. This disease is not easily detected in birds, except in advanced cases when it interferes with the locomotion. Injury on the sole of the foot resulting from jumping upon hard floors, roosting on very narrow perches, or stepping on nails and other sharp-pointed objects may produce this condition.

Several cases have been successfully treated at this College by opening the abscess and removing the core and painting the wound with tincture of iodine after disinfecting it. During this treatment the birds were confined in dry quarters with soft litter on the floor.

FEATHER PULLING

This trouble is often noticed among fowls kept in a limited range. The birds pick their own and each other's feathers. A case was observed in the College flock where a Rhode Island Red hen died as a result of this vice. There were a number of other hens in the compartment, all of them being broody. One of the hens began to pick feathers from the abdomen of this Rhode Island Red hen. The other hens in the compartment also began to pick on this hen till a hole was made through the abdominal wall; when, later, the intestines protruded through this hole the hens picked on the intestine also until it was cut. As a consequence the hen died.

Feather pulling is usually due to deficiency of animal protein in the diet. Supply the deficiency in the ration and avoid a monotonous diet of a restricted number of elements. Let the birds out on a wide, grassy range. If the birds have to be confined, place them in a roomy compartment.

EGG EATING

Egg eating is a habit that is often begun through the hen eating an egg accidentally broken. It may also be the result of the same cause that induces feather pulling. Birds having this vice can be distinguished from the rest by

careful examination of their beaks. Provide the nests with plenty of nesting materials to prevent accidental breaking of eggs. Do not give the hens any more eggs than they can conveniently sit on. Keep the inside of the nests dark so that if an egg be broken the hens cannot see it. Examine the nests for any broken eggs and clean them. Hens that persist in the habit of egg eating should be killed.

NATURAL ENEMIES

One of the main causes of failure in raising chickens is the large losses due to animal enemies, such as iguanas (*bayawak*), snakes, hawks, crows, wild cats, dogs, rats, and men. Protection is the only way to keep the flock from harm from these enemies. Chickens should be housed reasonably near the residence and the yards kept clean from thick brush. The use of traps with dead chickens as bait has been found effective against iguanas and rats. Dogs sometimes develop the bad habit of chasing and killing chickens, not necessarily to eat them, but for the fun of it. Such dogs should not be turned loose in the poultry yards. Scarecrows and a shot gun will help drive the hawks and crows away from the chickens.

A POULTRYMAN'S MEDICINE CHEST

Every poultry raiser will find that the following remedies will be useful to have on hand:

Lysol; Creolin; Bichloride of Mercury; Potassium Permanganate.—These are all disinfectants, and every farmer should have one of them in his medicine cabinet. They should be used in the following strength:

Lysol.—One-half to two per cent solution in water, or about twenty drops to an ordinary beer bottle of water.

Creolin.—One-half to one per cent, or enough creolin to make the solution appear like rice-water.

Bichloride of Mercury.—One-tenth per cent, or one ordinary tablet to one beer bottle of water.

Potassium Permanganate.—One to four per cent or enough of the crystals that when dissolved in water will color the solution deep pink.

Tincture of Iodine.—To be applied on any wound. For chicken pox, apply on the raw surface left after the crust has been removed. Tincture of iodine is also used for treating early cases of diphtheria.

Iodoform.—Valuable in treating sores and ulcers. For chicken pox, it is applied on the raw surface after the crust has been removed.

Lunar Caustic.—For diphtheria, apply in pencil form on the diphtheritic areas after the false membranes have been removed.

Powdered Tobacco.—For killing round-worms. This is mixed with the mash feed.

Areca-nut Powder.—For killing both round-worms and tape-worms. Given in the form of pills.

Epsom Salts.—A purgative. It is given to birds after treating them for intestinal parasites. Epsom salts is given to birds for practically all kinds of intestinal troubles.

Castor Oil.—A purgative. Dose one to two teaspoonfuls, depending upon the age of bird. Castor oil is also useful in any kind of intestinal irritation and inflammation.

Powdered Sulphur.—Very effective in destroying mites when used in an ointment.

Sodium Fluoride.—For dusting lice-infested birds.

Vaseline; Lard.—For killing lice. Applied around the vent, under the wings, and on the head in the case of small chicks.

Bandages and Cotton.—For general use.

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CURRENT ECONOMICS OF TROPICAL PRODUCTION: II

PHILIPPINE SUGAR

For over four hundred years the one commodity among the foodstuffs of the world in point of political influence has been sugar. The cereals, legumes, and roots are insignificant as international factors due to their generality of distribution, their variety, and relatively unexacting climatic requirements. Edwin E. Slosson provides an excellent popular account of the influence of sugar power on history in *The World's Work. 45: 495-508* which every student of sugar or of economy would do well to read. He shows in his brilliant style the sugar diplomacy that ruled Europe from the fall of the Venetian monopoly in 1500 to almost the present day. Oil and rubber are but recent pets of sovereigns, envoys, and parliaments. Sugar with her record of romance and infamy may only nod askance at these two annoying *parvenus*.

It is not the province of this paper to draw an abstract of the interesting history of sugar, nor to examine the ultimates of the industry. Rather, attention is called to some immediate factors of the Philippine industry and its American market.

Philippine sugar exports.—Since early in the nineteenth century Philippine sugar (cane) has appeared in export, becoming significant in the seventies at over two million English hundred-weight. There was a gradual increase from 1875 to 1895 with no fluctuations below the two million mark. In 1895 over seven million hundred-weight was exported. Between 1895 and 1904, due largely to public disorder, exportation dropped to an inconsiderable position. By 1905 a recovery had been made and the volume from that time to this has fluctuated between two and five million hundred-weight until 1922 when the eight million point was reached.

Relative to other Philippine exports, sugar exceeded 30 per cent of all exports and held premier rank on a basis of value from 1855 to 1895. This relative importance was lost in 1896 and not regained until 1920 when the centrifugal product had replaced to a considerable extent the muscovado. In that year sugar assumed again first place among Philippine exports. Centrifugal sugar entered the export lists in 1914. Since 1920 it has constituted the bulk of all sugar exported.

With the exception of but ten years between 1855 and 1905, over 20 per cent, on a basis of value, of the Philippine sugar export has reached the United States. Not infrequently during this period the proportion exported to the United States exceeded 50 per cent and in six years exceeded 60 per cent. The relative importance of the United States market declined considerably between 1895 and 1907. From 1908 until the present the average proportion sent to the United States has been 60 per cent. In 1922 over 78 per cent in value of sugar exports went to the United States. The reason for the apparently stable United States market for Philippine sugar is two-fold: (1) favorable free entry as against foreign and Cuban sugar since 1913; and (2) the recent change from muscovado to centrifugal product limits the export of Philippine sugar to either the United States or Europe, effectively closing the Asiatic market. The first cause is un-

doubtedly the greater. Indeed, the second may well be looked upon as a result rather than a cause. By 1900 the United States began to limit its purchases to centrifugal and the shift in Philippine manufacture, muscovado to centrifugal, was a direct response—a necessary change in order to hold the United States market.

Federal protection of Philippine sugar.—Considering the facts—that very little American capital is interested in Philippine sugar production, that, on the contrary, American capital virtually controls the Cuban output, that the Cuban output is in excess of United States imports, that every pound of Philippine sugar entering the United States forces a pound of Cuban sugar to the less favorable European market—it must be apparent that free entrance of Philippine sugar while Cuba is held to a stiff duty, constitutes a deliberate and politic protection accorded the Philippines against the interest of American capitalists. The schedules of tariff follow. They apply to 96° centrifugal sugar although several lower schedules hold for 70° to 90° products.

(A) Underwood Tariff, October 31, 1913, to May 27, 1921:
  (1) $1.26 a cwt. against foreign countries, except Cuba.
  (2) $1.00 a cwt. against Cuba.
  (3) Free for Philippines.

(B) Emergency Tariff, May 28, 1921, to September 22, 1922:
  (1) $2.00 a cwt. against foreign countries, except Cuba.
  (2) $1.60 a cwt. against Cuba.
  (3) Free for Philippines.

(C) Fordney Tariff, September 23, 1922, to date:
  (1) $2.21 a cwt. against foreign countries, except Cuba.
  (2) $1.76 a cwt. against Cuba.
  (3) Free for Philippines.

The increasing monetary value to Philippine producers of free entrance to the United States market is tabulated below.

TABLE I.—*Showing United States tariff advantage to Philippine sugar producers.*

Year.	Exportation to United States 96° centrifugal cane sugar.	Tariff rate against foreign countries except Cuba.	Tariff profit to Philippine producers as compared with foreign producers.	Tariff rate against Cuba.	Tariff profit to Philippine producers as compared with Cuban producers.
	cwt.	*dollars per cwt.*	*dollars*	*dollars per cwt.*	*dollars*
1917-1918....	1,392,111	1.26	1,754,060	1.00	1,392,111
1918-1919....	562,396	1.26	708,619	1.00	562,396
1919-1920....	907,016	1.26	1,142,840	1.00	907,016
1920-1921....	3,573,390	1.26	4,502,471	1.00	3,573,390
1921-1922....	5,232,231	2.00	10,464,462	1.60	8,371,569
1922-1923....	4,978,561	2.21	11,002,619	1.76	8,762,267
	16,645,705		29,575,071		23,568,749

Table I indicates the possible maximum and possible minimum advantage accruing to Philippine producers, through their ability to enter their commodity free of duty into the highest sugar market of the world. The maximum is arrived

at by taking advantage of the duty against foreign countries, except Cuba, which amounts to $29,575,071 for the six-year period, 1917 to 1923. The minimum is arrived at by taking advantage of the lower duty against Cuba, which amounts to $23,568,749 for the same period. The actual advantage lies between these points, probably nearer to the maximum. For conservative estimation the norm, $26,500,000, may be taken as a sure total momentary advantage enjoyed by the Philippine producers during the period 1917 to 1923.

Local subsidization.—It may be considered that the Federal protection extended to Philippine sugar would have in itself constituted sufficient encouragement to the production of centrifugal sugar in the Islands. Such, however, was not the case. Muscovado sugar had required little capital and small technical efficiency, whereas centrifugal sugar was found to necessitate heavy investment and expert management. The production of modern elaborated agricultural commodities requires in notable degree industry, ingenuity for management, and a fund of savings for investment. The Islands possessed, of these three requisites, the industry, but neither of the other two. Foreign capital was diverted in Europe by war and disorder, in America by the absorption of alien-held securities thrown on the market because of war, and by post-war industrial impetus. Entrance of foreign capital was, moreover, discouraged by strictly limited land laws enacted, be it said, by the early, American, and absolute Philippine Commission. But, although the Philippine Islands was in possession of no surplus personal wealth for the capitalization of centrifugal mills during the war and post-war years, the extremely favorable balance of trade drew heavy revenues to the Insular Government. These revenues stacked up annually to twice the average yearly budget. Much of them was expended in extension of a theretofore economical governmental machine. Still there remained an excess. The paucity of modern industries, the improbability of individual initiative undertaking them, combined with the political value of a treasury surplus led the local government into a strong and unresisted temptation toward the fantasy of government ownership. Railroading, coal, petroleum, cement, were undertaken on a national ownership basis. Incontinent loans for the building of coconut oil and sugar mills were made. These operations headed up in a National Development Company for mineral industries and a National Bank (92 per cent government owned) for agricultural and commercial loans. When, under these ambitious schemes the actual surplus was early consumed, resort was had to the entirely reprehensible act of removing the gold reserves behind the Philippine currency from safe American depositories and adding them to the capital of the National Bank.

In such manner, it became possible for Government to furnish some $20,000,000 as against the planters' $3,000,000 for the establishment of six sugar centrals. During the period 1918 to 1920 these centrals were built and largely put into operation. Government investment in them was secured by mortgages of the centrals and the planters' lands—mortgages confessedly non-collectable. To date the capital and interest have not been satisfactorily liquidated. In the financial management of the centrals, there had by 1922 been incurred deficits of $4,000,000. In 1921 the National Bank to protect its interests took over the management of the mills and organized the Philippine Sugar Centrals Agency to consolidate and economize in operations.

As to the production of sugar, the centrals today rank a success; as to financial management, they have been a complete failure and the government has until very lately lost on every unit of sugar produced. Only the planters may have profited as they have been in a position to throw the bulk of capital cost on to the Government.

The amount of local subsidization enjoyed by Philippine producers of centrifugal sugar, around $30,000,000, is about equal to a yearly budget of the Insular Government. Moreover, the amount is equivalent to more than one dollar out of six of revenues received from all sources by the Government during the years 1918 to 1922. It is doubtful if any government, other than that of the Philippine Islands, has in modern times devoted in proportion to its income so liberal an aid to any one industry, or in fact, to any group of industries.

Liquidating the "Bank" centrals.—Before the subsidized centrals had fairly begun operations, the Islands' trade balance swung to the negative and there came demand for the legitimate use of the dissipated currency reserves. The peso began a dangerous downward fluctuation. There came months when no exchange could be had, when practically the only sources of negotiable value attaching to Philippine currency were the intrinsic value of subsidiary coinage and the name of the United States of America printed on the face of the notes.

Rehabilitation, theoretically, could have been effected by selling the fixed assets of the Bank's industries including the sugar centrals. There was no use to attempt solution of the political difficulties surrounding such a procedure because there were at the time no purchasers. As an indirect policy had been employed in capitalizing the sugar and other industries, so an indirect method was followed in re-capitalizing the reserve funds. No direct appropriations from revenue were resorted to. Instead, the Philippine Islands unhesitatingly, but necessarily, increased the national debt by $51,000,000 dollars—rising from $16,-000,000 in 1916 to $67,000,000 in 1923—an increase of over 400 per cent. This was accomplished by the perilously simple process of selling bonds endorsed by the United States, to citizens of the United States.

It was assumed that at least a part of the increased debt could be offset by selling or bonding the sugar centrals. Sale of centrals would necessarily have to be to the planters, to other local capitalists, or to American capitalists.

The same planters who could not pay the interest and principal of the construction loans on the centrals obviously could not purchase except on a long time amortization, which would defeat the ends of the administration—"to get the Government out of business". Very recently (September 1923) an option for the sale of Binalbagan, the largest, and potentially the best, of the "Bank" centrals, valued at $5,500,000, has been granted to a group of local capitalists which includes some of the planters whose lands are contributary to Binalbagan. The figure is for 80 per cent of the original value: the time is three years; and both the option and the installments, in case of sale, are well secured. The National Bank management is to be congratulated on this excellent stroke of business.

If, by any chance, similar disposition could be effected before the end of 1924 in the case of the remaining five "Bank" centrals, and if firm efficient authority, such as now exists, should continue in the Philippine National Bank, thus obviating any leniency in collection of payments, the losses of sugar subsidization would be largely avoided. However, as time goes by, the interest,

straight and compound, on the construction loans piles up and results in an impossible ratio between the book and replacement values of the properties. With the scarcity of local capital, reasonable sale locally of all centrals is scarcely to be expected.

Suggestion of sale to American or foreign capitalists results in a tremendous political opposition. Planters are not willing to consider themselves bankrupt, although that is the status of many of them. It is the old story of paternal loans and government ownership. It illustrates perfectly the thesis that the government in business is usually an exception to all canons of good management and commercial ethics, and that when so employed the government is wont to place itself above the very code to which it holds its private competitors. It is safe to say that if the Philippine sugar central mortgages and planters' land mortgages were held by any private bank or syndicate, foreclosure would have been impressed on centrals and lands in Philippine courts of justice over two years ago.

For a time attention was focused on a general bonding scheme to include all six of the "Bank centrals. This culminated in but one offering, the so-called Hardon scheme (August 1923) which was rejected by the planters without whose co-operation any holding company would find operation very difficult.

There are three factors in the bonding problem: the Government holding frozen credits; the debtors, sugar planters, holding influence; and the investors holding cash. In any attempt to bond, there at once appear three points for settlement: (1) valuation; (2) guaranteed interest; and (3) control.

The debtors and investors agree to bond if Government will write off or defer (which perhaps means the same thing) about one half of the book value of the credits. This reduction is requested due to the fact that construction of centrals was undertaken at peak of supply and material prices, so that buildings and machinery can, it is alleged, be replaced at one-half their book value. No responsible independent appraisal of assets has been made to date and there exists no grounds on which to figure depreciation. The Hardon bonding plan called for a practical depreciation of 50 per cent. Compared with the 80 per cent sale figure in the case of Binalbagan this seems rather too great. Replacement value is, nevertheless, the only basis of physical inventory acceptable to bondholders. Who shall stand the depreciation? The planters point to the Government. The Government has a legal right to force the entire depreciation on the planters, a moral right to share it half and half, but possibly, the political necessity of shouldering it entirely.

The second point in issuing bonds, one which seems not to have attracted much attention when it appeared as the most significant clause in the Hardon bonding plan, is that the government should be required to guarantee the interest on the bonds. There is not a great difference between government ownership and government guarantee of interest on bonds. The chief difference between the two is that in the former the government has control while in the latter bondholders obtain dominance. Government management is invariably modified by political viewpoints; control by bondholders is usually efficient, but contrives somehow to disburse income to the holding company and, however prosperous the property may be, to pass on at least a part of the interest payment to the government.

There remains the question of control. Investors, speaking the only known language of secure capitalization, demand control equivalent to investment and naturally refuse to enter on a minority basis unless provided with a voting trust. The debtor planters desire that control rest with themselves or with the Government wherein their voices bear a significant import. The planters are thus asking, in effect, bonding without effective security. It is impossible. No bonds will ever be floated on such a basis. The government might be willing to accept a 50 per cent depreciation, it might be willing to guarantee interest on bonds, but there is small chance of planters and bonders agreeing on the point of control unless the former are forced to it by stern measures. If the planters insist on their stand, they merely force the Government to give them the property outright, to accept a lengthy amortization, or to foreclose. Of these alternatives; outright gift would constitute an impossible use of government revenue; amortization would keep the Government in business indefinitely; while foreclosure and outright sale to highest bidders, not only of the centrals but also of the planters' lands which stand mortgaged to the National Bank, would let the Government out and permit the logical development of the sugar industry—but of a sugar industry which would be largely owned by American or foreign capital. The Government has generously waited two years and it is only a question of time before foreclosure will result and the planters need make haste if they care to avoid that event through bonding or local sale.

Crop loans.—The sugar planters have been raising sugar cane and manufacturing sugar for thirty years. The last ten years have been years of decidedly high-priced sellers' markets. Despite this fact, a large part of the crop is planted and harvested on loans which now amount to about $2,000,000 annually. It would not, surely, be unreasonable to suppose that after so many years, after enjoying a tariff-protected sellers' market for ten years, and after having their mills capitalized on generous terms by their Government, the planters might have some apparent wealth, sufficient at least to put in the next year's crop. However, in all too few cases has this been true. There has been a plethora of extravagance and some gambling. Many planters have yet to exhibit the fundamentals of thrift. Of industry they have a-plenty, but the success of an economic enterprise depends on three things: industry, ingenuity, and *thrift*, and of these *thrift* is the greatest.

Planters cannot afford to be looked upon as wayward nursemaids of an infant industry—they must become dependable, thrifty men of affairs if they wish to control so important a factor in Philippine prosperity. To date, the bulk of sugar crop loans has been derived from Government funds. There is a fast approaching end to the inverted cornucopia theory of government in the Philippine Islands.

The future market.—In world commodities there frequently exists a phenomenon which for want of a better term may be called "the double market". This is true of Philippine sugar. There is an *actual and fictitious market* for all Philippine centrifugal sugar in the United States due only to free entrance as against Cuba. Without free entrance and $1.76 cwt. against Cuban sugar there would be no American port receiving Philippine sugar. The *natural and ultimate market* of Philippine sugar is Europe. The conclusion is upheld by a survey of regional

production and consumption of the commodity. Such a survey is presented statistically for recent years in Table II.

TABLE II.—*Regional production and consumption of sugar (cane and beet) in short tons.*

Region.	Production 1921-22.	Production 1922-23.	Consumption 1922.	Probable consumption 1923.	Probable surplus 1923.	Probable shortage 1923.	Probable world surplus 1923.
Americas...	9,020,222	8,344,125	7,362,000	7,509,240	834,885		
Asia.....	5,900,625	6,059,250	4,893,750	4,991,625	1,067,625		
Australasia.	409,500	373,500	315,000	321,300	52,200		
Europe.....	4,541,625	5,191,875	6,801,750	6,937,785		1,745,910	
Totals.....					1,954,710	1,745,910	208,800

Table II indicates that Europe alone has a sugar deficiency. Remove the United States advantage accorded Philippine sugar and the United States would supply itself entirely from Cuba and the Caribbean littoral and leave Philippine sugar to Europe—its natural market. The significance of this condition lies in the fact that, for permanency of the local industry, the cost of production must be lowered to meet the competition in European ports with European beet sugar. If our planters continue to devote any proceeds of the free entrance returns to cost of production—if they are satisfied with an annual profit of $10,000,000—they may eventually find themselves without a market whose average price will be higher than their production cost.

The market for Philippine centrifugal sugar must normally pass through two, possibly three phases. The first phase will cover that period during which a fictitious United States market will be assured through the extension of a preferential tariff schedule to the Philippine Islands. Such a phase we are now enjoying and will continue to enjoy until one of two things occur. Should the American consumer come to believe that the duty on Cuban sugar is the cause of the high retail price of the refined product, the Cuban duty will be taken off. The American housewife wishes to buy twenty pounds of refined sugar for a dollar as she did in 1910, and considering her boycott proclivities it is not beyond the bounds of reason for her to approximate that price. It does no good to tell her that sugar at ten cents a pound is the world's cheapest edible carbohydrate. Again, should a purely locally owned production reach such proportions as to come into vital competition with the American capitalized Cuban product, there would be a strong movement to abandon free entrance of Philippine sugar. Either of these eventualities would end the present market for Philippine sugar. The chances of abandoning the free entrance favor would be decreased if any considerable amount of American capital were invested in the local industry. In the event of Philippine independence the United States is bound by treaty to allow Cuban sugar a twenty per cent preference over all foreign sugars including the Philippines.

The second phase of the marketing of Philippine sugar will be contingent upon the cessation of the first phase. It will be signaled by the necessity of discovering, competing in, and holding a European market. Successful tenancy of

such a market would depend, as mentioned, on ability to produce and lay down in European ports at a cost equal to or less than the cost of production in Europe of beet sugar. Whether the Philippine producers will be able to accomplish the movement can not be forecasted. On their present plane of efficiency they could not. Because of post-war conditions in Europe, especially the depreciation of Old World currencies, it is not profitable to attempt an analysis of present cost of European beet production.

The more remote third phase in the marketing of Philippine sugar would be dictated by the establishment of an American demand exceeding possible production in the United States, Hawaii, Cuba, the Caribbean littoral, Central America, and Northern South America. In this case, there remaining a regional deficiency in the Americas, Philippine or other Asiatic sugar would be called upon to re-enter the United States at favorable prices.

Thus it must be held in mind that on a basis of present analysis the *natural* market for Philippine and other Asiatic sugar is Europe, not the United States; that the *natural* competitor with Philippine and other Asiatic sugar is European beet sugar, not Cuban cane sugar; and that for permanency of the local industry cost of production must be radically lowered.

Summary.—Philippine sugar has been in the past and is again today the first of Philippine exports It has become in bulk a centrifugal product, planted and harvested by Government loans, capitalized by Government subsidy, and marketed by virtue of Federal protection. An end of subsidy and loans is at hand, an end of Federal protection not improbable, and the necessity for clear, farsighted efficiency in production impends.

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Professor of Economics.

A GENERAL SURVEY OF THE LIVE STOCK INDUSTRY IN THE PROVINCE OF ROMBLON[1]

By Miguel Manresa

Of the College of Veterinary Science.

Romblon Province, located south of the island of Luzon and east of Mindoro Island, consists of four fair-sized islands and numerous smaller ones. This group of islands rises about 800 meters above sea level. The undulating hills and table lands, covered with cogon and other forage plants, well watered by springs and creeks, furnish splendid pasture for live stock. The rainfall is quite evenly distributed. Long dry seasons seldom occur. The location, topography, and climate of the province are so favorable for the raising of live stock that this industry has been carried on profitably for generations in Romblon.

Though accessible for small vessels Romblon is not on the trade routes. This partial isolation has been an effective protection to the live stock against contagious diseases.

Rinderpest was first observed on Tablas, one of the four larger islands of the province, in 1902. It is commonly believed that the infection was brought over from Masbate with salted meat. Owing to lack of knowledge of the nature of the disease, it ran the usual course spreading from place to place. The mortality was high. When it finally abated it left the island practically destitute of animals. The infection was carried to the island of Romblon, another of the larger islands, along the routes of inter-island traffic.

In 1908 rinderpest again broke out on the island of Romblon, being first noticed among swine. The former experience with the contagiousness of this disease and the severe losses which it caused during the previous outbreak stimulated the live stock owners to united efforts for its control. Although Badajoz, a municipality on the island of Tablas facing Romblon, was seriously afflicted, quarantine measures and strict prohibition of the movement of cattle, carabaos and swine, instituted and carried out by the people, who were all interested live stock owners, limited the outbreak to a few barrios.

So far as can be determined, rinderpest has never appeared on the islands of Sibuyan and Banton, two of the large islands of the province.

Stock-owners state that foot-and-mouth disease locally known as *pac-is* has been observed at various times in various places in Tablas and Romblon. Information from reliable sources show that in 1918 a disease similar to foot-and-mouth disease with symptoms of excessive drooling, severe lameness, and complete loosening of the hoofs was observed among carabaos in the barrio of Magallanes, island of Sibuyan. Thirteen animals belonging to one man were affected. All of these made very slow but complete recovery. Since then the disease has not been reported on the island.

Severe losses among swine, goats, and fowls have occurred at various times. Whether specific infectious diseases are to be charged with these losses will require systematic investigation along scientific lines.

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[1] Experiment Station contribution No. 134.

OWNERSHIP AND MANAGEMENT OF LIVE STOCK

Owners and managers of live stock in the province of Romblon may be divided into four groups:

1. Owners of a few animals only.
2. Partnerships, where a number of animals are furnished by a wealthy proprietor to other parties (*pa-alila*).
3. Regularly organized live stock associations (*sociedad*) in charge of administrators (*encargados*).
4. Live stock haciendas owned and managed by proprietors.

By rough estimate about 90 per cent of the stock owners belong to the first group. Small land owners that have a few animals only, select animals of a good type and give them the benefit of personal care and attention.

When the number of animals that can be properly handled by one individual has been exceeded, the excess is either sold or given to others under the partnership system known as the *alila* system. An unwritten contract dividing the offspring on the basis of fifty-fifty is entered into.

With very few exceptions the regularly organized live stock haciendas are managed through administrators (*encargados*). These administrators as a rule are not well versed in even the elementary principles of animal husbandry, so that they are not able or sufficiently interested to improve the types of animals on these haciendas. Many of these administrators do not see the stock once a year. The result is that the poorest types of animals in the province are found on these large haciendas.

Live stock farms owned and managed by their proprietors can be counted on the fingers of two hands. Animals on these farms are given better care and are therefore more docile and of far better type than those owned in partnership or association. The owners derive a great deal of their revenue from the sale of live stock, so that they have developed a system of stock raising which gives satisfactory financial returns.

ANIMAL POPULATION

Mere figures showing the number of animals in any given locality are misleading when they refer to animals of different sizes and weights. But figures do show many facts about live stock. For this reason an attempt was made to secure the latest census of animals in the province of Romblon. The figures given in Table I were reported by presidents of the different municipalities:

Municipalities	Cattle			Carabaos			Horses		
	M	F	Total	M	F	Total	M	F	Total
Badajoz	187	655	842	278	400	678	70	127	197
Cajidiocan [a]	—	—	872	—	—	1,417	—	—	527
Concepción [a]	—	—	1,173	—	—	21	—	—	25
Despujol	660	989	1,649	621	766	1,387	165	214	379
Jones (Banton)	352	1,080	1,432	378	555	933	62	107	169
Look [a]	—	—	4,014	—	—	3,823	—	—	603
Odiongan	2,138	4,274	6,412	653	1,320	1,973	195	386	581
Romblon	161	1,289	1,450	80	330	410	36	10	46
San Fernando	163	616	779	278	406	684	107	200	307
Total	—	—	18,623	—	—	11,326	—	—	2,834

[a] Figures furnished by the Director of Agriculture.

For purposes of comparison Table II is given. Data are from the Philippine Census (1918):

Number of carabaos of specified classes

Municipality.	Steers.	Bulls.	Cows.	Calves.	Totals.
Badajoz	150	225	357	179	911
Cajidiocan	357	340	612	410	1,719
Concepcion	22	32	8		62
Jones (Banton)	89	157	422	144	812
Look	597	582	1,452	754	3,385
Odiongan	1,088	645	1,786	821	4,340
Romblon	62	63	142	68	335
San Fernando	123	176	291	111	701
Grand Total	2,488	2,220	5,062	2,495	12,265

Number of cattle, horses, swine, goats, and sheep.

Municipality.	Cattle.	Horses.	Swine.	Goats.	Sheep.
Badajoz	1,842	175	1,483	870	64
Cajidiocan	1,151	182	1,432	804	43
Concepcion	721	6	851	242	9
Jones (Banton)	1,197	134	2,692	862	4
Look	3,699	338	2,763	1,257	31
Odiongan	4,153	564	2,668	1,139	55
Romblon	987	33	2,035	691	52
San Fernando	1,231	301	1,472	68	1
Totals [a]	14,981	1,733	15,396	5,933	259

[a] These figures include 4 Australian cattle, 41 Indian bulls, 86 grade mestizos, and 5 American horses, which were in the province in 1918. These animals were used for breeding purposes, but we were not able to trace their offspring or find animals of a better type resulting from this cross.

From the data given in Tables I and II it appears that there has been a decrease of 939 carabaos and an increase of 3,642 cattle and 1,101 horses. The decrease in the number of carabaos is due to the great demand for work animals in the province of Capiz which suffered heavy losses from rinderpest in 1921 and 1922.

Statistics from a bulletin issued recently by the Bureau of Commerce and Industry show that from 1916 to 1918 the number of foreign cattle slaughtered for consumption in the city of Manila was 11,390 while the native cattle slaughtered for similar purposes was 52,205, a difference of 40,815 head in favor of the local supply. This ratio is reversed in the years from 1918 to 1922 when the number of foreign cattle went up to 65,071 while the native dropped to 39,597 giving a 25,474 head against the local supply. Undoubtedly this decrease in part has

been responsible for the increase in the cattle population in the province of Romblon during the last four years.

EXPORTATION OF ANIMALS

For years the province of Romblon has been exporting all kinds of live stock, horses, carabaos, beef cattle, and even swine. The principal markets are Manila, Batangas, Capiz, Iloilo, and Negros. Beef cattle are shipped to Manila and Batangas while Capiz, Iloilo, and Negros get most of the work animals. Small shipments are carried on sailboats while large ones are made by steamer.

Since the year 1919 the demand for Romblon cattle in Manila has been very limited due to the competition offered by the Indian and Hongkong animals. The sale of work animals to Iloilo and Negros during the last few years has been likewise very limited. Negros and Iloilo hacenderos prefer the imported Indian buffaloes because they feed on dry grass and are relatively more resistant to rinderpest.

By far the greatest number of swine and poultry consumed in Romblon are obtained from the island of Banton, one of the four large islands in the province. Raising and fattening for market is well developed in that community. Tablas and Sibuyan do not export swine or poultry in great numbers, the local demand absorbing practically all that is produced.

NATURAL HELP TO LIVE STOCK

As stated previously the somewhat remote position of this group of islands protects the live stock quite effectively from epidemics and cattle plagues. Most of the pasture lands are close to the sea, making transportation of animals for export easy. Cattle egrets, sometimes spoken of as carabao birds, which feed on carabao lice and cattle ticks are numerous.

The favorable natural conditions for cattle raising should be conserved, so that an even more productive live stock industry can be developed and maintained. We can already observe that the indiscriminate destruction of wooded areas in the hills has caused the disappearance of numerous springs and creeks, unfavorably affecting good grazing grounds.

The people do not realize the immense value that the live stock industry derives from the carabao birds (*Bubulcus coromandus,* Boddaert). Many cases of indiscriminate shooting of these birds have been observed. The Philippine Constabulary is doing very creditable work in protecting, not only these birds, but all animals that are of help to agriculture; such work can not be effectively done without the co-operation of the people.

PROBLEMS FOR THE ANIMAL HUSBANDRY MAN

The most striking feature of the animals in Romblon is their small size. Old residents, to many of whom the live stock industry means so much, complain continually, stating that their animals were larger, of far better type, more desirable in every way, many years ago. Formerly carabaos exported from Romblon were large and strong, splendid work animals. Today the majority are so small, so poorly developed that it is often difficult to sell them for a good price.

A Manila cattle dealer once made the remark that Romblon cattle were as large as goats. Unfortunately this terse statement is near the truth. The animals raised on large stock farms, supervised by administrators (*encargados*) are inva-

riably of this undesirable type. They are wild, handled and loaded with difficulty and refuse food on board ship. This explains why losses from shrinkage are so great.

Horses raised on these islands, although pasture grass is very abundant, are of no better quality. They are small, pot bellied, and of bad conformation. The prevailing colors are dun, mouse-colored, and dark gray. Approximately twenty years ago Romblon horses, better known as Tablas horses, were famous for their size, strength, and endurance. Degeneration has been most marked during the last twelve years.

Lack of knowledge of the principles of elementary animal husbandry must be considered the important factor responsible for this condition. The practice of selling the largest and best animals because the owners get better prices for them has greatly aggravated this condition.

It is of the utmost economic importance that the factors causing these undesirable retrogressive changes should be known, so that proper management and breeding, upon which improvement of type depends, can be carried out. Demonstration of the beneficial results obtained by breeding to selected, desirable types of sire and dam requires many years, but the knowledge is so fundamental that efforts along such lines should be made. Introduction of new type of pedigreed animals will give quicker results. A step in the right direction would be to castrate all undesirable males as well as inferior females. With cattle the increase in value as beef animals will amply justify the expense and risk, besides removing the "scrub type" as a breeder.

VETERINARY PROBLEMS

There are no severely destructive contagious animal diseases in the province of Romblon at the present time. The last serious outbreak of rinderpest occurred in 1908. The island of Masbate, however, which is only 32 miles from Sibuyan, has been seriously afflicted with rinderpest. It must be considered infected territory so that boats, carrying merchandise and small animals to the clean islands of Romblon are a constant source of danger. This local interisland traffic must be carefully supervised and effective quarantine measures kept in force, in order to extend to the live stock industry of the province of Romblon the protection which it so well deserves.

A number of stock owners believe that foot-and-mouth disease is endemic in their islands. They state that this scourge has been observed quite frequently in different localities. In each outbreak a small number of animals only appear to have been afflicted. It is quite probable that the few outbreaks claimed to be foot-and-mouth disease were cases of poisoning caused by irritating forage plants. Circumstances did not permit substantial conclusions in regard to these sporadic, limited outbreaks.

A disease affecting young cattle and carabaos from a few weeks to a few months old and commonly known as *boyog* is at present causing the greatest loss to live stock in the province. Two haciendas were visited. On the first hacienda, in a herd of about 300 animals, it was reported that an average of about 30 calves died every year. In another herd of about 500 head, the loss was nearly 50 every year. The symptoms of this disease as described by an observant live stock owner are: depression, discharges from the mouth, nose, and eyes, diarrheoa, rapid loss of flesh, and exhaustion followed by death. The disease does not appear

to be contagious, and is most commonly observed during the dry season. It is most prevalent on the island of Tablas, less so in Romblon, and least in Sibuyan. A superficial inquiry into the causes of this condition led to the following possibilities: bad management of the herd where newly born and very young animals are allowed to mix with the old ones; severe internal and external parasitic infestations; lack of good water; and the relative scarcity of suitable feed during the dry season when the young animals are being weaned.

Poisonous plants abound in Romblon; the most notorious of these belong to the genus *Derris* locally known as *tubli*, of which there are three well-known local species. A few of the other equally notorious plants are catchubong (*Datura alba* Nees), tuba (*Jatropha curcas* L), and tigao (*Callicarpa blancoi*, Rolfe). These plants are used frequently for poisoning streams and ponds for the purpose of catching fish. Animals partaking of the water in such ponds are poisoned and many of them die with symptoms of bloody diarrheoa often mistaken for rinderpest. Some cases of malicious poisoning of streams are on record.

A few of the more progressive live stock men have begun to castrate bulls. A number of carabaos are also castrated. This is usually done by persons who, while experienced in this routine operation, entertain many queer beliefs and superstitions. The most noteworthy of these is the opinion that the removal of the epididymis (puracus or dagat-daton) weakens the animal. A great majority of the carabao owners believe this to be a fact. The greatest number of animals are castrated during August and September, soon after the rice planting season. Castrated animals are not turned to work for about six months after the operation.

It would appear that an experienced, qualified veterinarian could develop a satisfactory practice in the course of a few years. The greatest difficulty would be to demonstrate and convince the stock owners that his advice in regard to selective breeding and live stock management as well as the careful execution of routine operations are of economic value, so that they will pay for his services. It is a fact that the live stock industry is the corner-stone of all progressive agriculture, and for the protection of this industry the science of veterinary medicine is an absolute necessity. Practising veterinarians could help government bureaus to obtain reliable data on the live stock industry and outbreaks of destructive diseases among the herds of this favored group of islands.

RECOMMENDATIONS

The establishment of at least two breeding stations, one on the island of Tablas and the other on the island of Sibuyan is an immediate necessity.

As long as the scrub bulls are permitted to breed promiscuously no improvement of animals is possible. The people do not realize the harm of this practice, hence a law should be enacted making the castration of undesirable males and inferior females compulsory.

It is recommended also that a systematic investigation for the purpose of determining the definite nature of the disease known as boyod, and the reported outbreak of foot-and-mouth be carried out.

Poisoning of live stock both innocently and maliciously occurs. It is important therefore that all poisonous plants be identified so that practical ways and means of treating poisoned animals can be devised.

COLLEGE AND ALUMNI NOTES

The Philippine Society of Technical Agriculturists met at the College of Agriculture in August 26, 1923. A number of scientific papers were read in the morning meeting, and Dean Baker addressed the gathering after the banquet. A number of new members were admitted. The meeting was very well attended, and was a very pronounced success. The leaders in this organization are mostly graduates of this College. Among the visiting members were Acting Secretary Apostol, of the Department of Agriculture and Natural Resources, and Director Sanvictores of the Bureau of Non-Christian Tribes. Professor Elayda, '15, is the president of the Society and J. Q. Dacanay, '15, the secretary.

Many an alumnus of this College has been saved from embarrassment by the College of Agriculture Alumni Association through its loan fund. This fund is formed by the members depositing two per cent of their monthly salaries in the treasury of the association. These deposits draw an interest of four per cent which is distributed at the end of every calendar year. This is one of the activities of which the members of the College of Agriculture Alumni Association may feel proud.

Dr. Hamilton and family, whose home is on the Mission property adjoining the Campus on the north, are again occupying their house after an absence of more than two years, most of which time was spent in the States, with the last eight months in Manila. The Sunday services are maintained at the Student Union Church at nine o'clock in the morning, with a welcome for all. The library and reading room conducted in a room of the building is open every night for the benefit of all who wish to read books, papers and magazines. During the summer semester Mrs. Nelson found a number of choice volumes of fiction on the shelves which admirably served her purpose in teaching a course in history, books which could be obtained nowhere else locally. A new Mission residence is being constructed next to the church and when occupied Dr. Hamilton's former residence will be turned into a dormitory for students.

The Makiling Ladies' Club, a local organization composed of the wives of the members of the faculties of the Colleges of Agriculture and Veterinary Science and the School of Forestry, is one of the most active organizations in this community. It holds meetings regularly. The establishment of a local puericulture center is the present work of the Club. Mrs. M. L. Roxas is the president of the organization and Mrs. Valente Villegas is the secretary.

Saturday, July 14, 1923, was a Field Day at the College. The student body turned out *en masse* to put the athletic fields of the College in shape for the coming season. This has been the annual practice during the last ten years.

Three new cottages are being erected by the College on the Faculty Hill. With the four that were built in 1920, there will be seven of these structures on the Hill. But the number of Faculty residences will still be inadequate.

A party was given by the Ranchers' Club at the New Animal Husbandry Building in August 18, 1923, in honor of Dr. and Mrs. Gonzalez, and of Dr. and Mrs. Fronda. Dr. Gonzalez and his family recently arrived from abroad. Dr. Fronda, the adviser of the Club, who has recently joined the "Order of the Benedicts," was presented with a cane in recognition of the services he has rendered the Club.

The entire Junior Class of the High School Department of the Centro Escolar de Señoritas had an excursion to Los Baños-College on August 18.

Juan P. Torres, '19, was at the College in August to bid his professors and friends good-bye. Mr. Torres is one of the pensionados appointed from the Bureau of Agriculture, where he was employed as rice breeder stationed at Alabang. Mr. Torres expects to specialize in plant breeding in United States.

Dr. Francisco O. Santos, '19, was married to Miss Pacita de Guzman, a student in the School of Pharmacy, University of the Philippines, in July 29, 1923, at the Catholic Church in Malolos, Bulacan, the home town of the bride. A surprise party was given in honor of the couple at the Roxas' residence on August 12. Doctor Santos is at present Assistant Professor in Agricultural Chemistry of this College.

Dr. Leopoldo Clemente has been appointed instructor in entomology. Doctor Clemente is expected to arrive in the Islands from the United States about the latter part of September. He is scheduled to teach, agricultural zoology and elementary genetics. Doctor Clemente was formerly an assistant in agronomy in this College. He is a member of the class of 1917.

José Mendoza, a former student in this College, was a recent visitor in Los Baños. He has just arrived from the United States where he continued his studies after leaving the College a few years ago. He studied first in the Oregon Agricultural College where he received his B. S. degree, and he then proceeded to the University of Illinois to take some post-graduate work in Botany. He received the degree of Master of Science from that University in June, 1923.

Ramón K. Habaluyas, '19, is now Superintendent of Fabrication in the Malabon Sugar Company, at Malabon, Rizal. Mr. Habaluyas was formerly connected with this College as Assistant in Mathematics.

Simplicio Festin, '20, was married sometime ago to Miss Crispina Millares of Romblon, Romblon. Mr. Festin was formerly the Agricultural Adviser for the province of Romblon, but resigned from the service soon after his marriage to take charge of his own farm. This farm, which consists of about three hundred hectares of land—rice, coconut, and pasture land, was given to him by his father as a marriage dowry.

Messrs. Lazerna '22, Neric, '21, Ponce, '22, Padilla, '22, Acuña, '23, Olofernes, '23, Tenebro, '23, Bernardo, '21, Teruel, '23, Cagurangan, '16, Pelino, '22, and Bacomo, '16, members of the College of Agriculture Alumni Association, have been recently appointed in the different school divisions of the Bureau of Education.

D. B. Paguirigan, '16, was a visitor in the College on August 6 and 7, 1923. He is at present Assistant Agronomist in Charge of Tobacco Investigations, of the Bureau of Agriculture. The bulk of Mr. Paguirigan's work is now concentrated in Cagayan Valley. He came to the College to consult with Doctor Mendiola, '14, of the Agronomy Department about the breeding of wrapper strains of tobacco by selection and hybridization.

Francisco Bernardo, '21, has accepted a position as teacher in the Iloilo High School.

Messrs. Antenor-Cruz, Carreon, Cruz, Celis, Ferrer, Gordon, Jaojoco, Juliano, Mamaril, Nacion, Opiana, and Reyes, of the class of 1923 are back in the College taking post-graduate courses in various branches of agriculture.

The College carpenters are busy renovating the old animal husbandry bodega. This building when finished will be used temporarily to house the Los Baños branch of the Department of Military Science and Tactics.

Felix Maramba, a former student of this College, was recently appointed instructor in mathematics. Mr. Maramba is a holder of the Bachelor of Science degree from the University of Illinois, and of the Master of Science degree from the Iowa State College. He returned from abroad less than a year ago.

Enrique Lopez, '23, is located in Quingua, Bulacan, managing a one-hundred hectare farm. Like all new graduates who go out to farm, Mr. Lopez writes that he is meeting problems of all sorts and asks advice from some of his former professors in the College.

Francisco Galang, '14, was at the College in July. Mr. Galang is at present employed in the Bureau of Agriculture. He was formerly in charge of the Lamao Agricultural Experiment Station in the province of Bataan.

Domingo Casiano, a former student in the College, returned to complete the course. Mr. Casiano was to have graduated with the class of 1919, but the lures of Mindanao attracted him to accept a position as teacher in agriculture in the Provincial School of Zamboanga in 1916. After two years of successful service in that capacity, he resigned to accept another position with the Philippine National Company also in Zamboanga.

Mr. Andres Goseco, '20, visited the College in July to buy a Nellore bull for the "Ganadería Filipina," a livestock corporation of which he is the manager.

José Dimaano, '23, is teaching biology in the High School at Romblon, Romblon.

Gonzalo Merino, '14, spent a few hours at the College during June. He is chief of Plant Pest Control in the Bureau of Agriculture.

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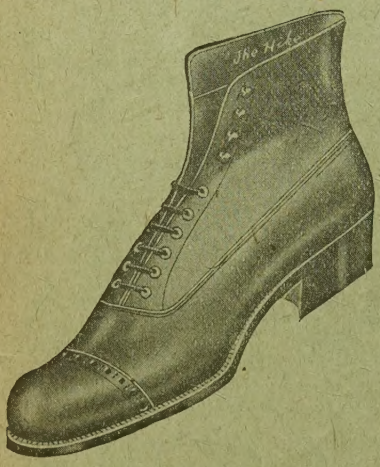

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